

APPENDIX S

Pipeline Temperature Effects Study

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Appendix S Pipeline Temperature Effects Study

TransCanada Pipeline, LP (Keystone) has assessed how the proposed 36 inch 900,000 bpd pipeline will affect soil temperatures along the proposed route. The assessment considered the following factors:

- (a) Temperature of the proposed pipeline, including variation with time and/or distance along the route.
- (b) Heat flux from the proposed pipeline into the surrounding soil, including variation with time.
- (c) Expected changes to soil temperature profiles, including variation with time and distance from the pipeline.
- (d) At what distance from the pipeline will elevated soil temperature be undetectable?
- (e) How many acres of land in total will experience significantly elevated soil temperatures?
- (f) How will crops and vegetation be affected by any increased temperature?

(a) Temperature of the proposed pipeline, including variation with time and/or distance along the route.

Steady-state temperature profiles were modeled for the Keystone XL Project (Project) for winter and summer operations at 900,000 barrels per day (bbl/d) (**Figure 1**). These profiles are based on assumed oil properties, as well as soil temperatures and thermal conductivities along the pipeline route. The analysis assumes that the pipeline ships 80 percent diluted bitumen and 20 percent synthetic crude.

In general, temperatures of the pipe exterior are higher in the summer months than in the winter months due to the ambient air and soil temperatures. Similarly, temperatures generally increase as volumes increase.

(b) Heat flux from the proposed pipeline into the surrounding soil, including variation with time.

A series of heat flux were calculated using a one-dimensional shape factor model that is based on the calculated steady-state pipe temperatures provided in response a) above, and the undisturbed soil temperatures and thermal conductivities at pipeline depth along the route. (**Figure 2**). These figures are based on a thermal conductivity profile along the Project route.

Although the temperatures of both the soil and the oil in the pipe are higher in summer than in winter, the steady-state heat flux is not expected to vary much throughout the year since it is proportional to the difference between the pipe and soil temperatures, and this difference does not vary much at different times of year (i.e., when soil temperatures are higher, so are flowing temperatures within the pipe).

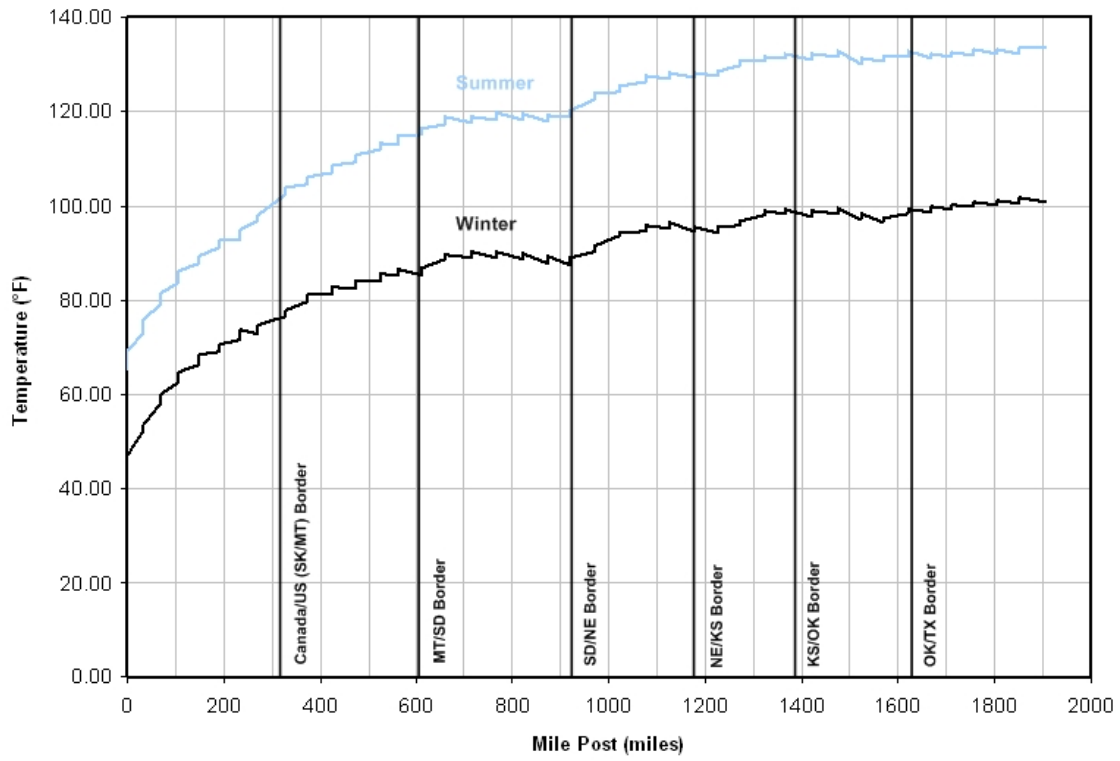


Figure 1

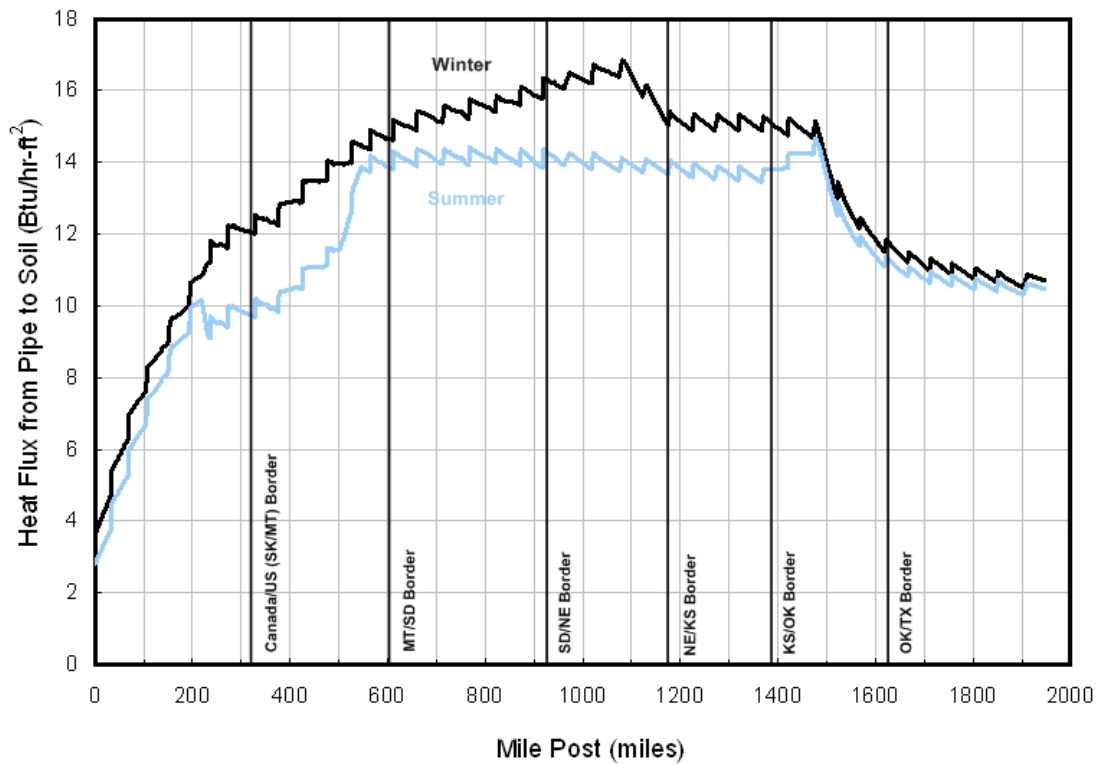


Figure 2

(C) **Expected changes to soil temperature profiles, including variation with time and distance from the pipeline.**

Baseline soil temperatures were developed using long-term climate and soils data from the following locations:

- Near Glasgow, Montana;
- Near Sioux Falls, South Dakota;
- Near Lincoln, Nebraska;
- Near Wichita, Kansas;
- Near Oklahoma City, Oklahoma; and
- Near Houston, Texas.

The anticipated, year-after-year, pipeline temperature variations for the 900,000 bbl/d cases provided in the response to part a) above were also utilized.

These areas of the pipeline route were selected for comparative review since an abundance of climate and soils data was publicly available to support the analyses. These temperature data are representative of the temperature profile along the pipeline route:

Temperature Contour for 900,000 bbl/d

Figures 3 through 32 show the temperature profiles around and alongside the pipeline operating at 900,000 bbl/d for selected months. As shown in the figures, the pipeline does have some effect on surrounding soil temperatures, primarily at pipeline depth. Surficial soil temperatures relevant to vegetation are impacted mainly by climate with negligible effect attributable to the operating pipeline. The thermally influenced contour intervals are represented by colored contours, the corresponding temperatures are shown at the bottom of the figures.

Glasgow, Montana Figure 3 to Figure 7:

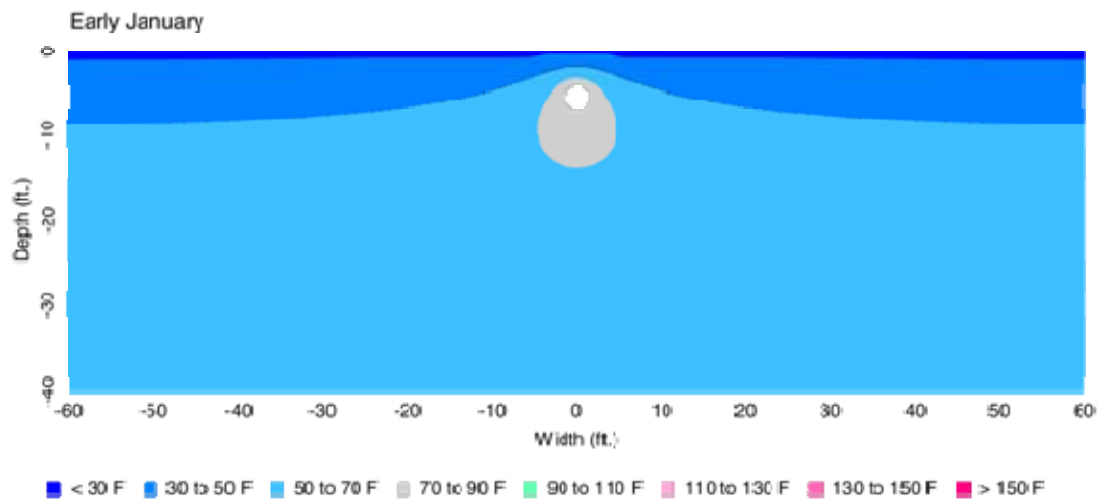


Figure 3

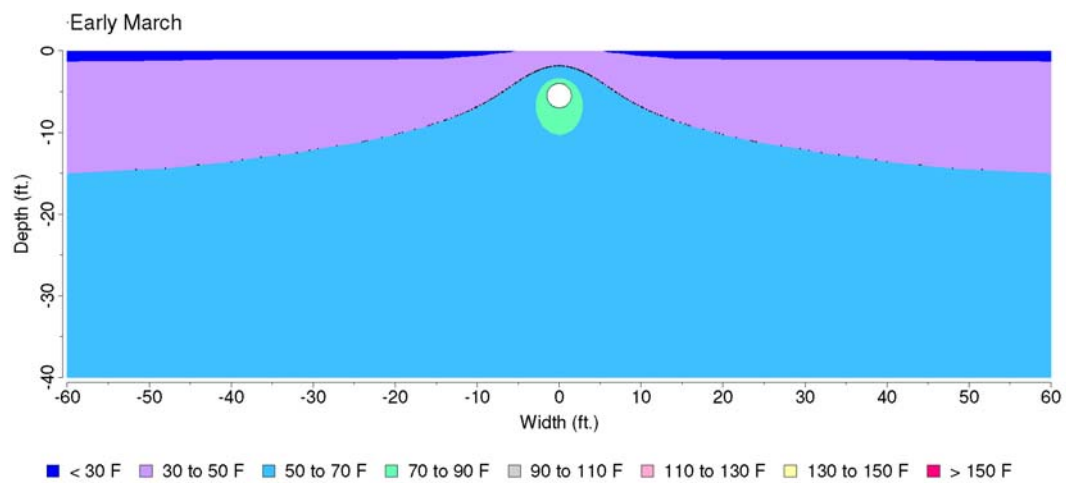


Figure 4

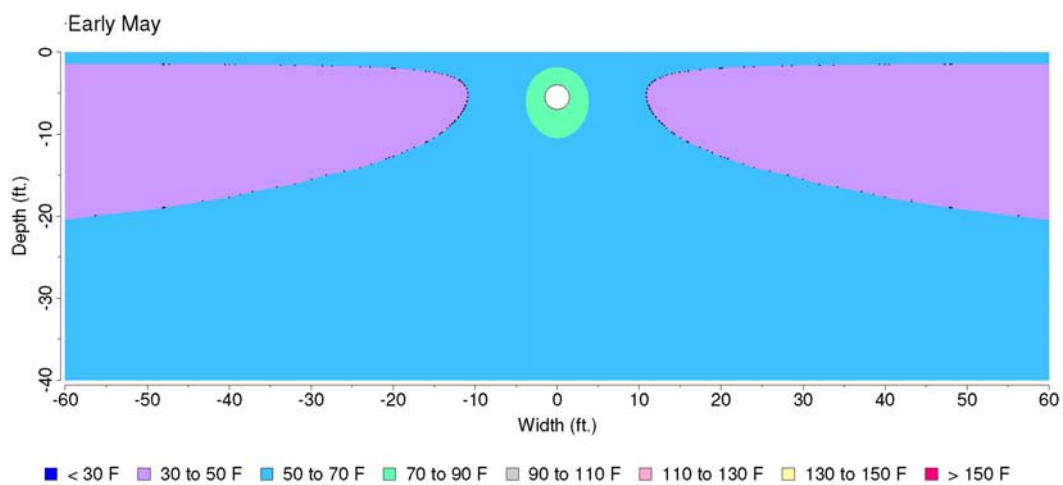


Figure 5

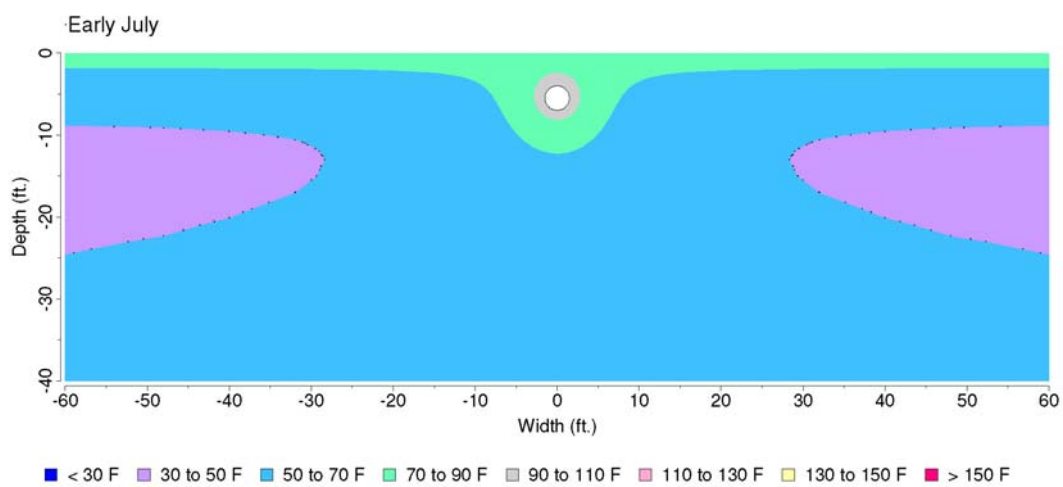


Figure 6

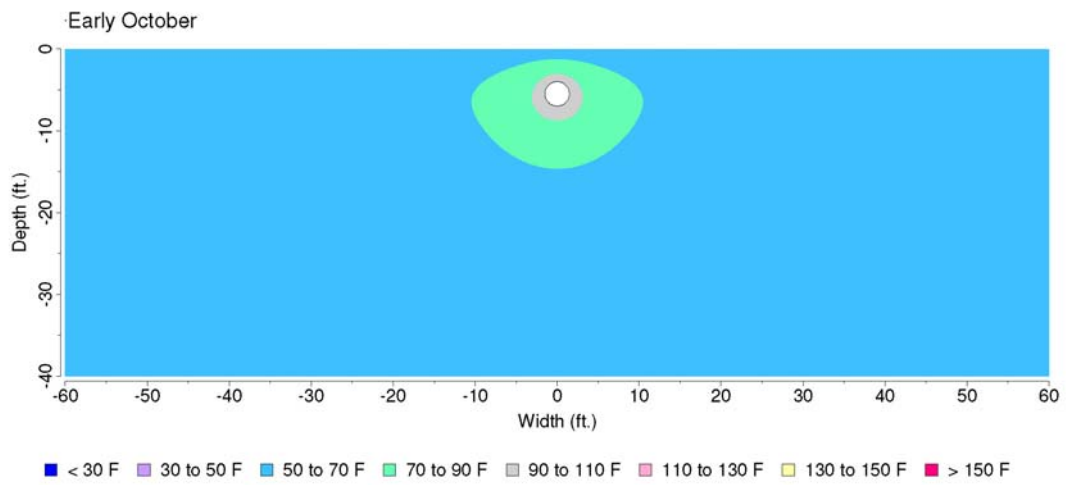


Figure 7

Sioux Falls, South Dakota Figure 8 to Figure 12

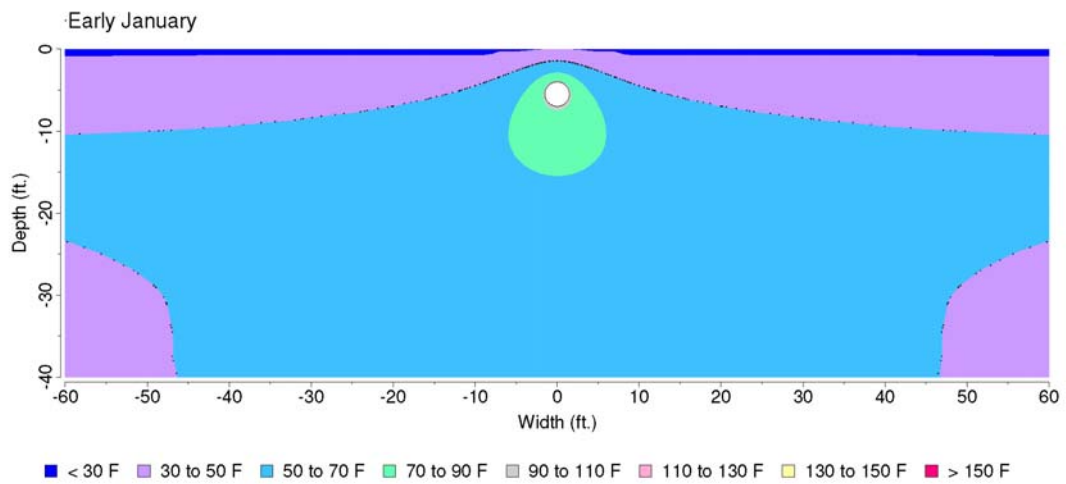


Figure 8

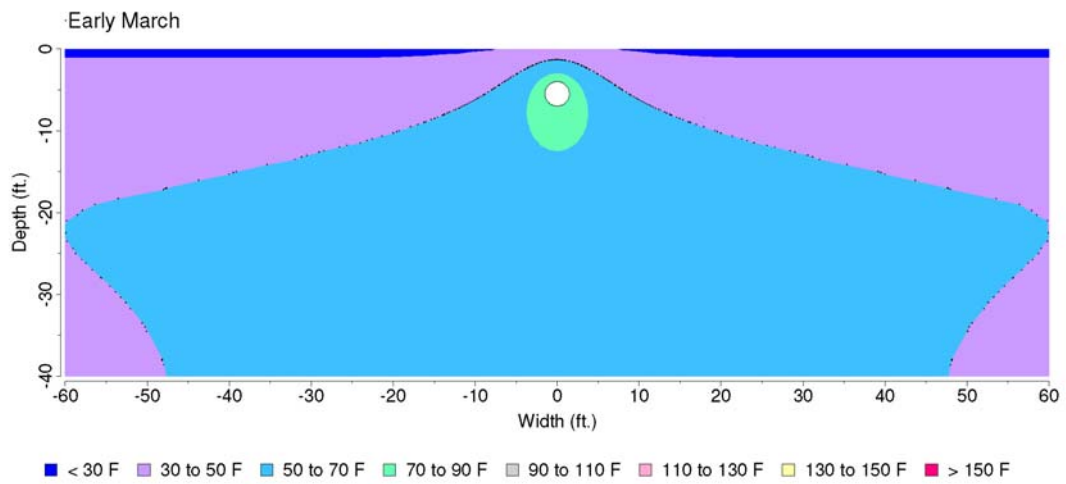


Figure 9

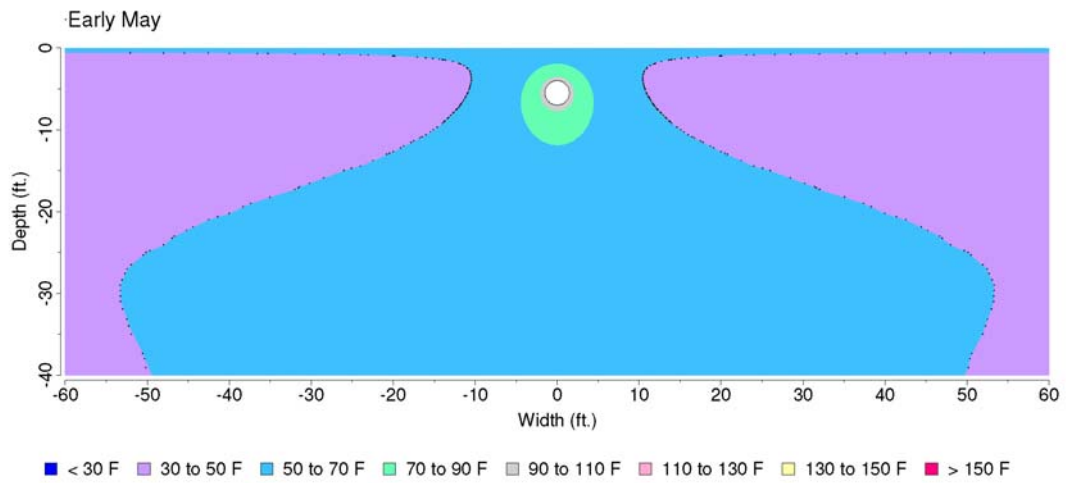


Figure 10

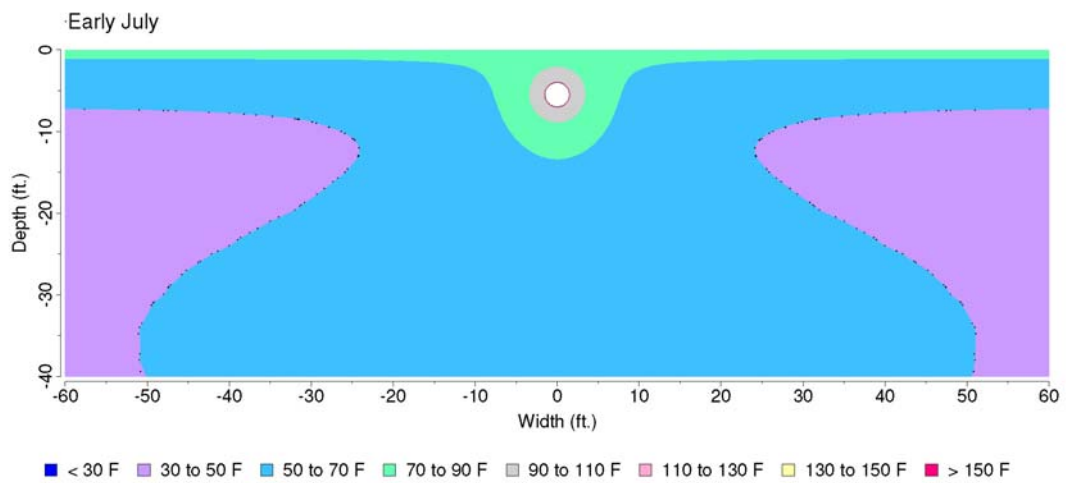


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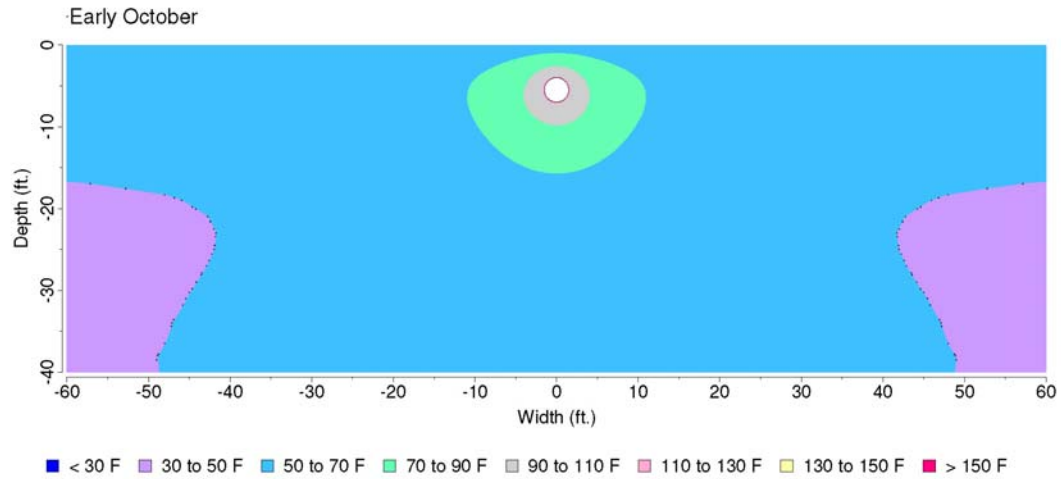


Figure 12

Lincoln, Nebraska Figure 13 to Figure 17

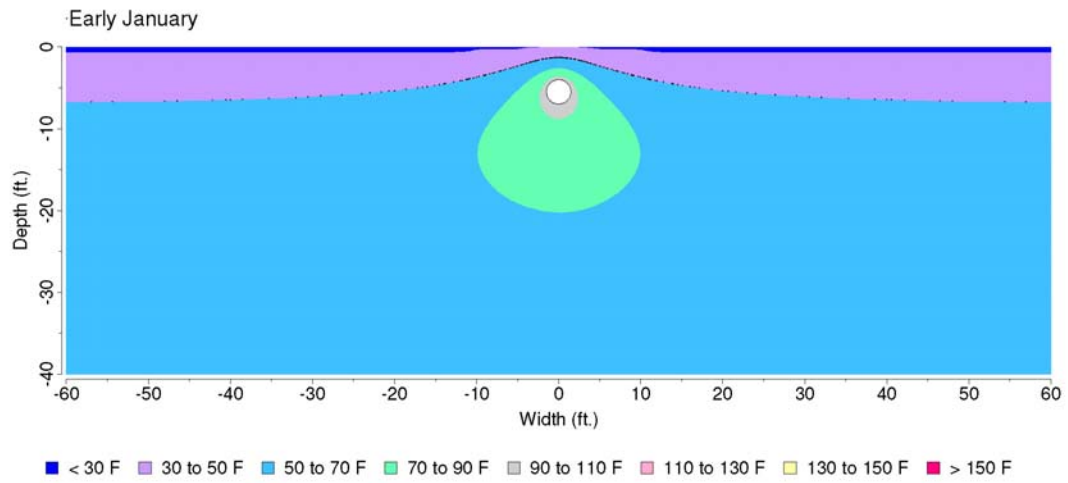


Figure 13

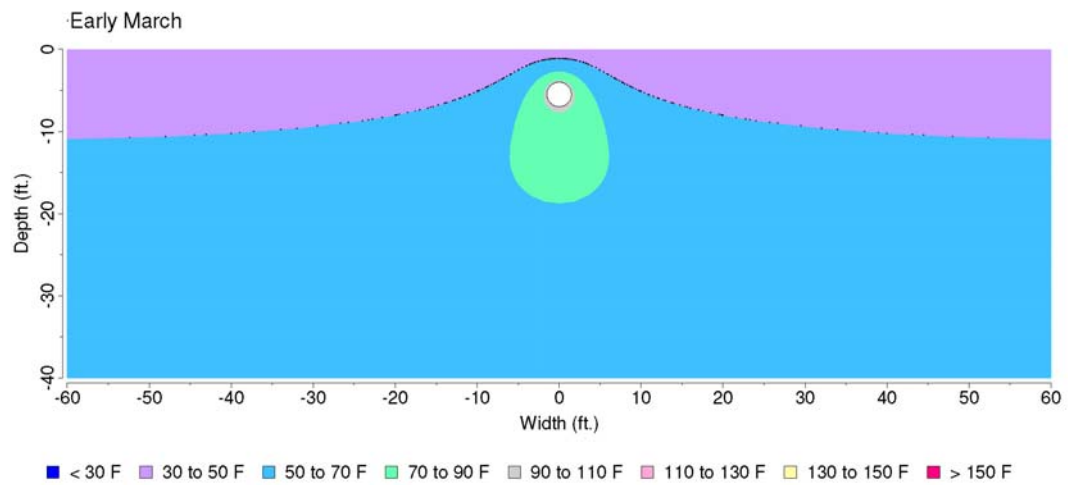


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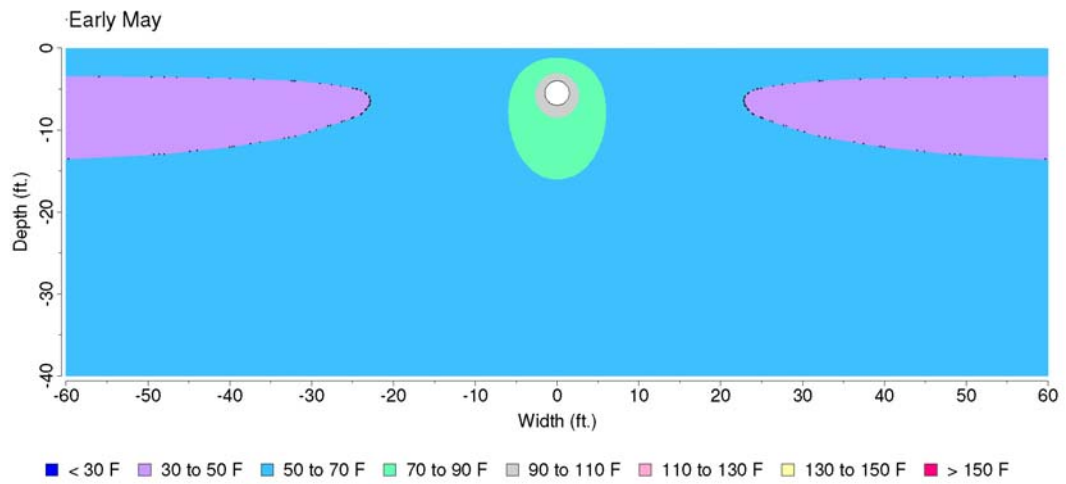


Figure 15

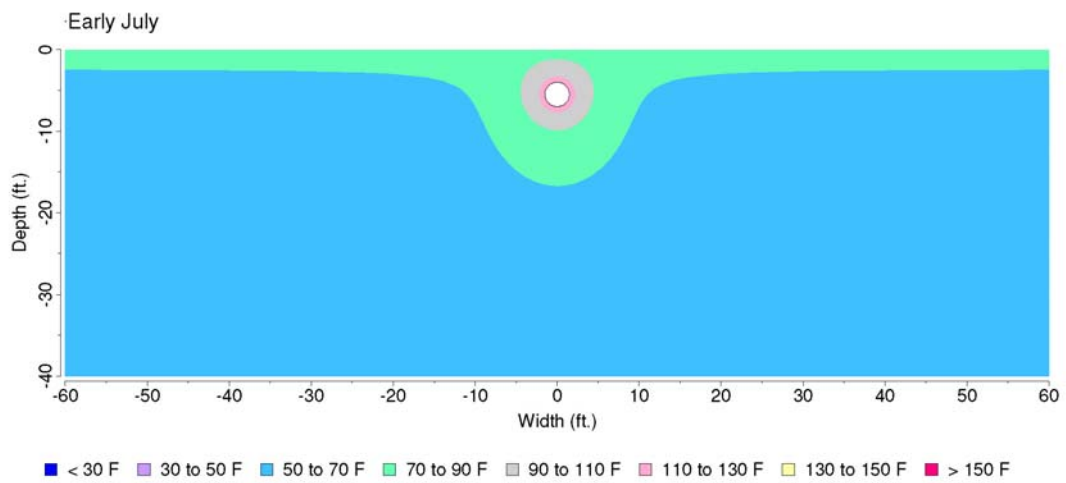


Figure 16

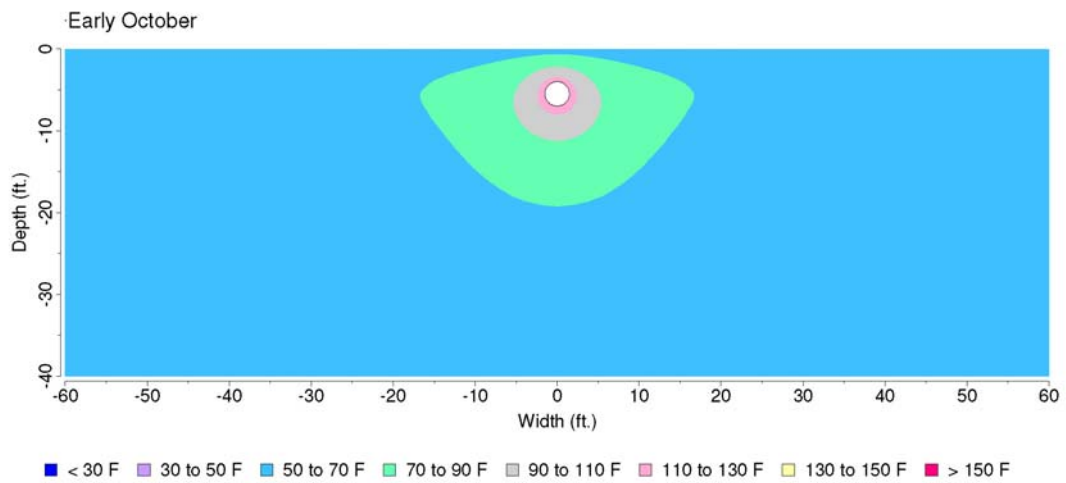


Figure 17

Wichita, Kansas Figure 18 to Figure 22

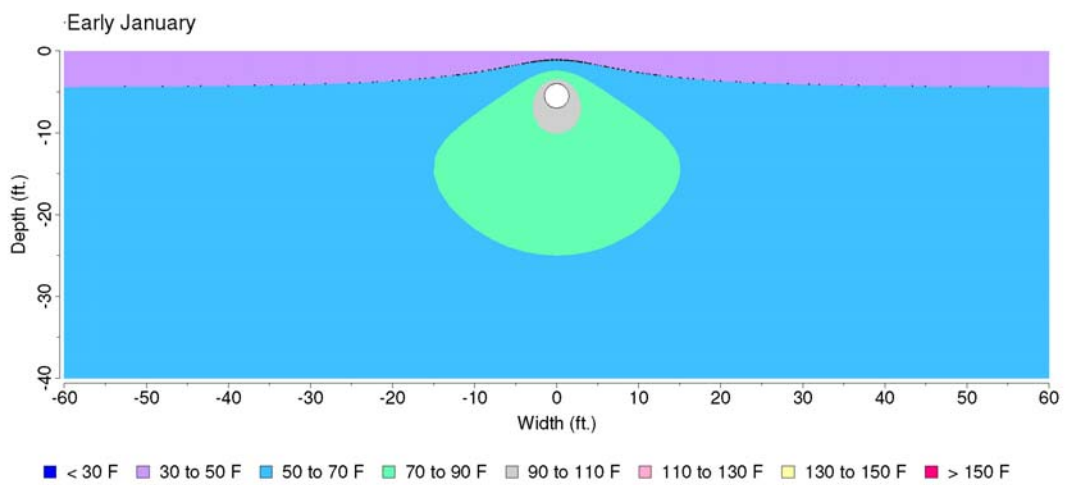


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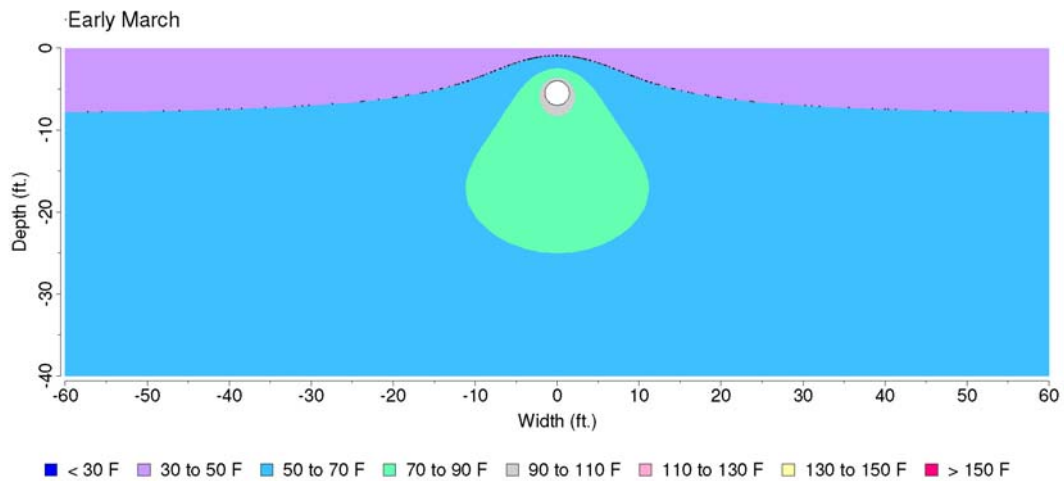


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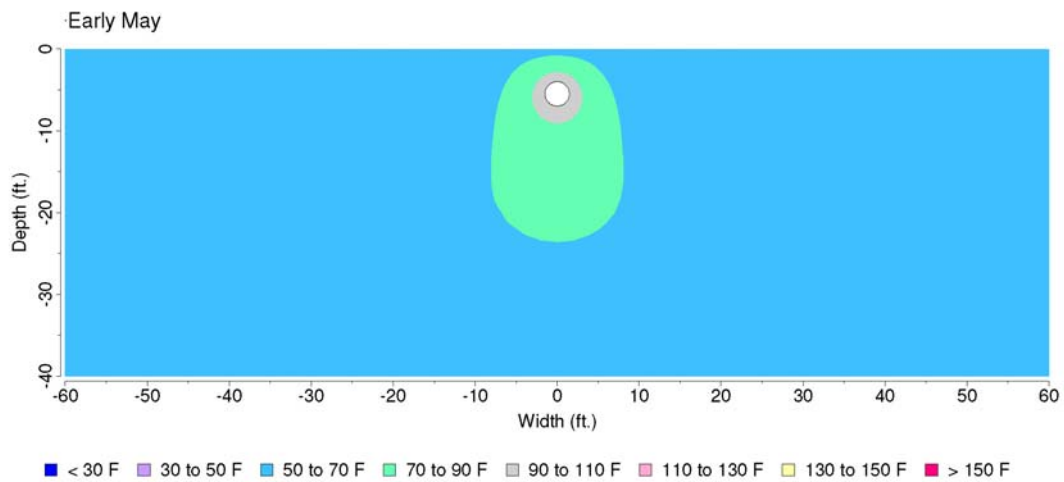


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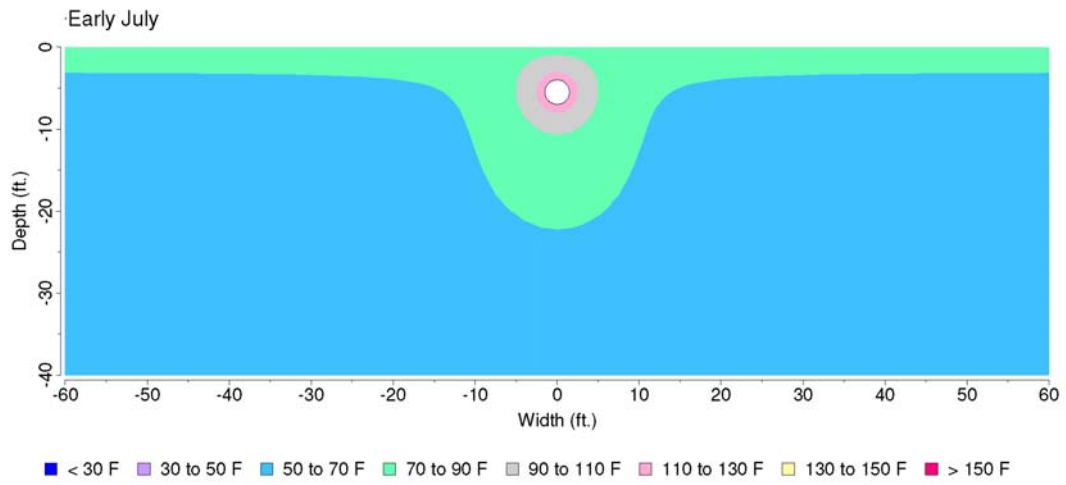


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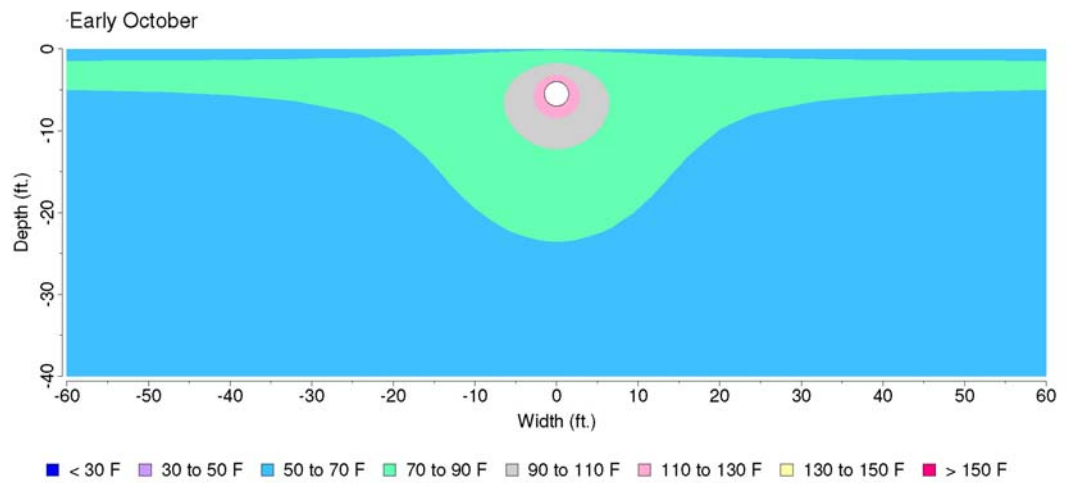


Figure 22

Oklahoma City, Oklahoma Figure 23 to Figure 27

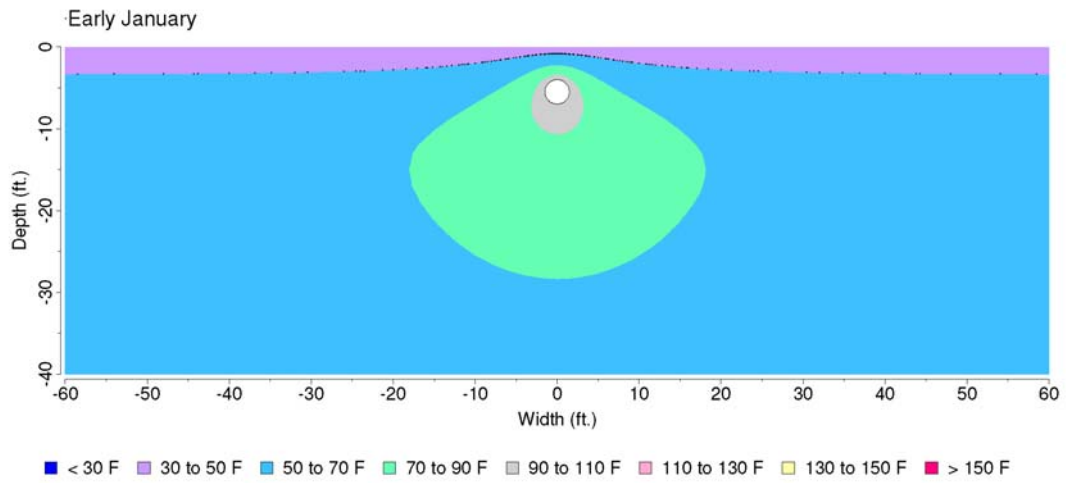


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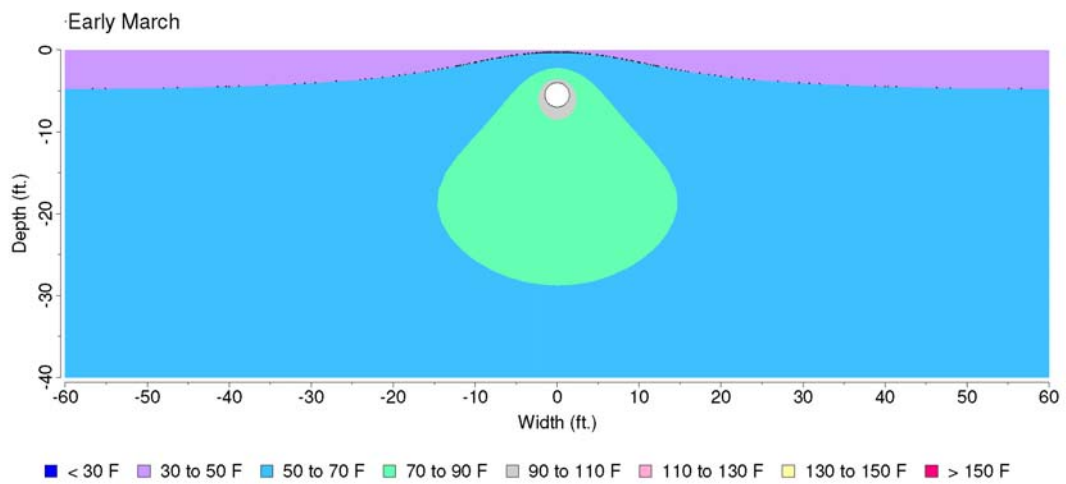


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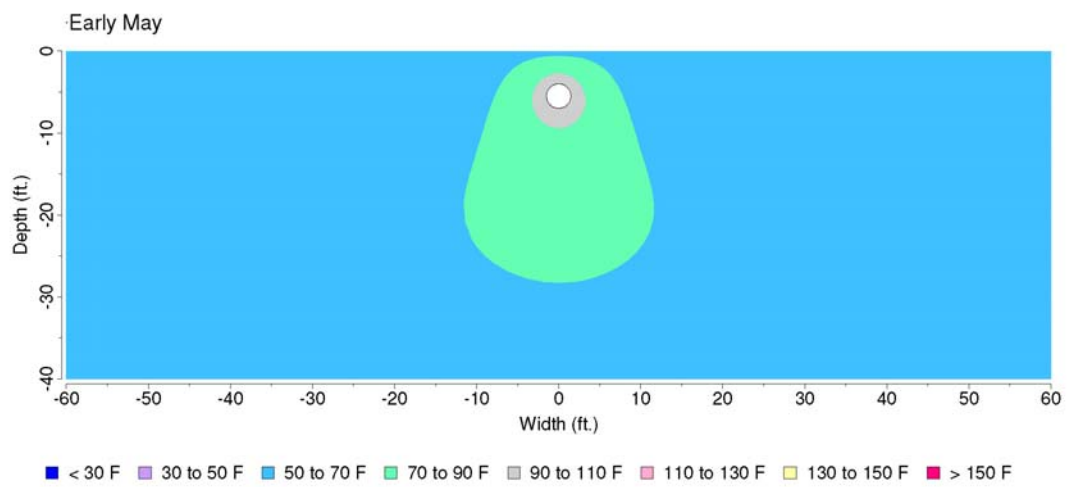


Figure 25

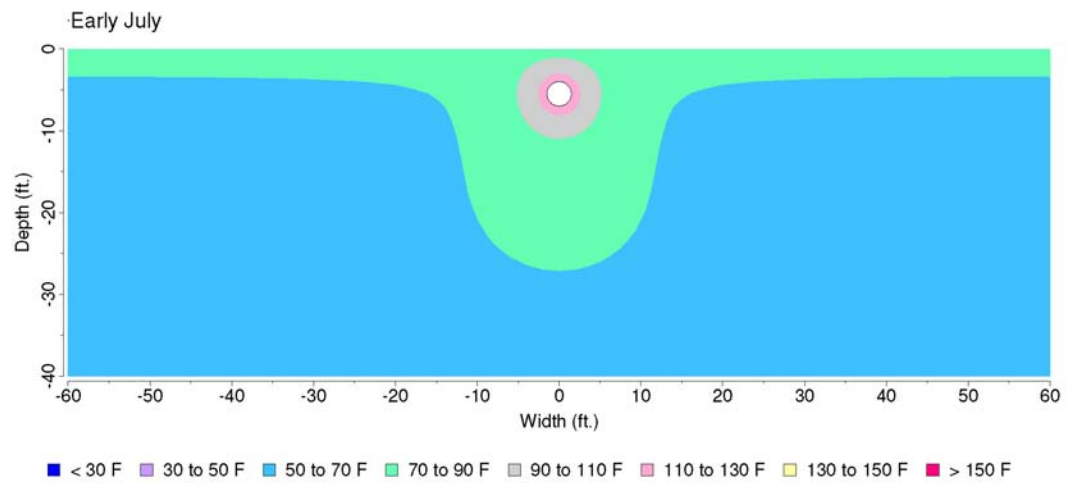


Figure 26

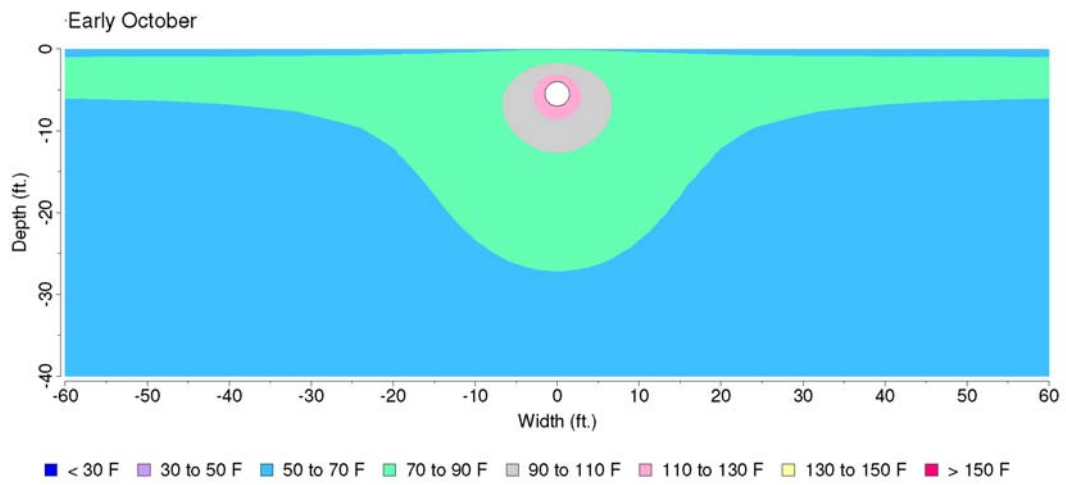


Figure 27

Houston, Texas Figure 28 to Figure 32

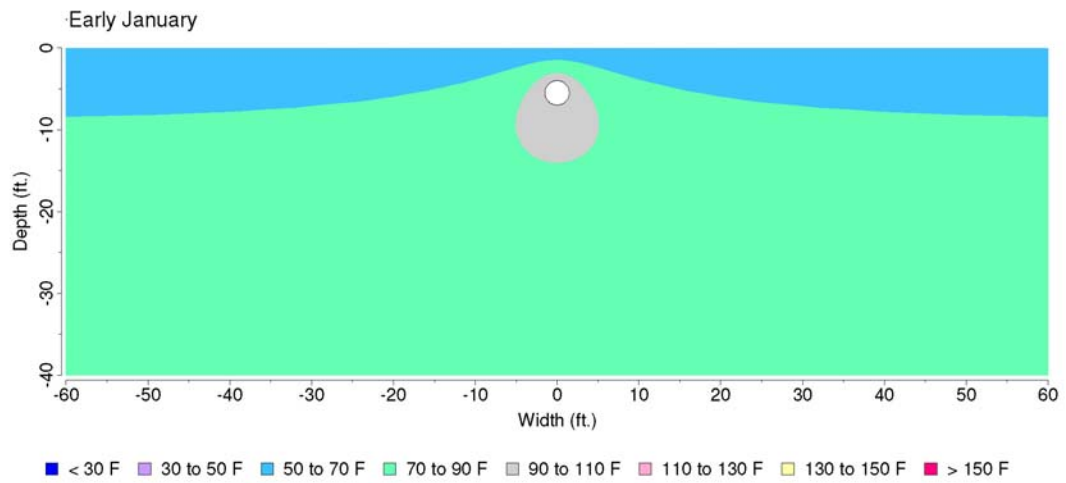


Figure 28

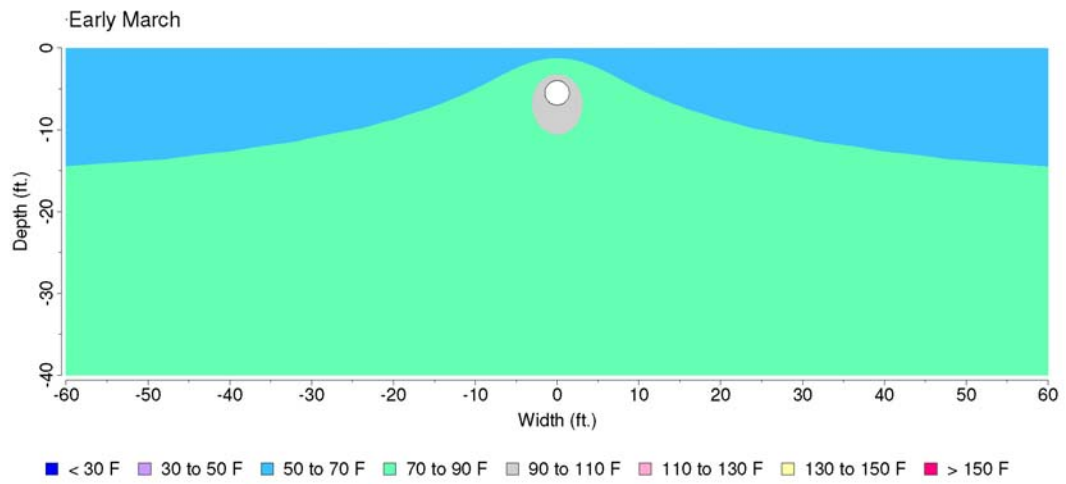


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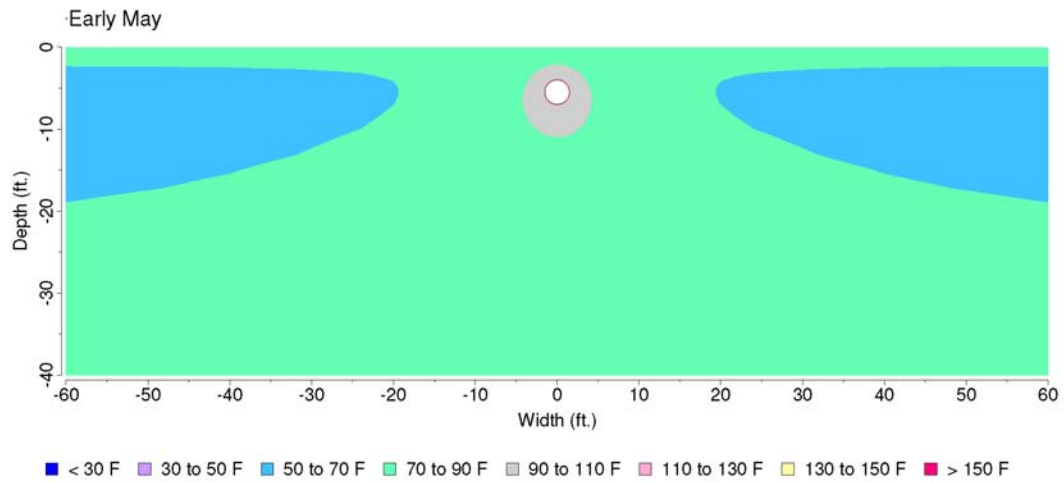


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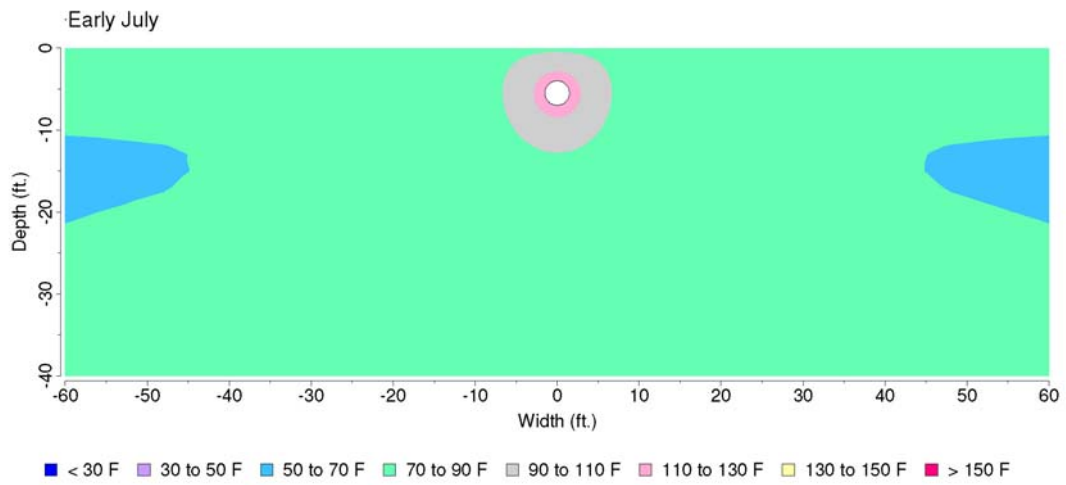


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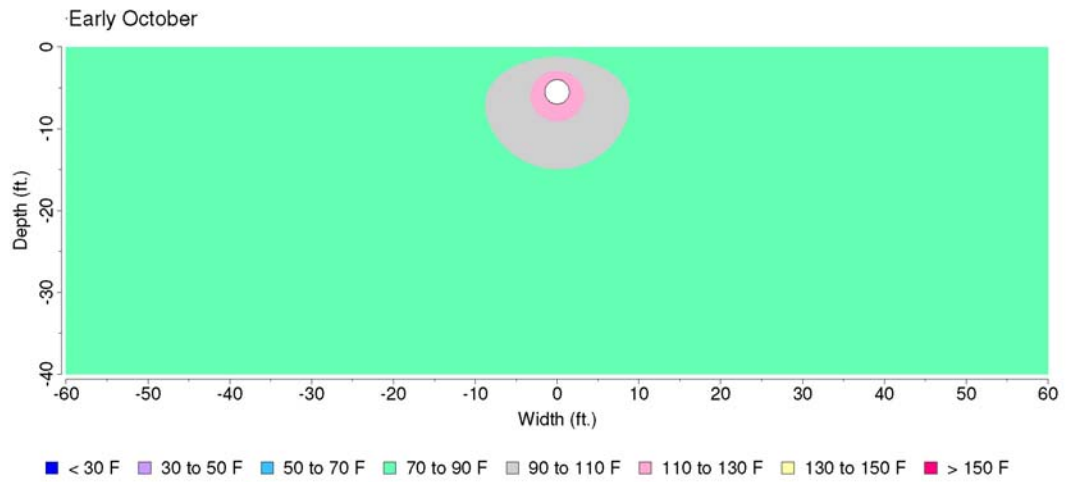


Figure 32

(d) **At what distance from the pipeline will elevated soil temperature be undetectable?**

The analyses shown in part c) above were used to predict the potential effect on soil temperatures at specified distances from the pipe centerline at the surface and at a depth of 6 inches. This largely defines the region of soil of most relevance to vegetation. The effects are summarized in the figures below, which were established for 900,000 bbl/d case. The results indicate that the operating pipeline has negligible effects to these surficial soil temperatures.

Temperature Contour for 900,000 bbl/d

The temperature profiles from the centerline of the pipe at the ground surface and at a depth of six inches below the surface, as affected by the pipeline operating at 900,000 bbl/d, are provided in **Figure 33** to **Figure 44**. These figures show that temperatures above the pipeline and at various distances from it deviate minimally from the background temperature. This demonstrates that there is minimal effect on surficial soil temperatures due to the operating pipeline. This is particularly evident during the growing season, when surficial temperatures are primarily affected by climate.

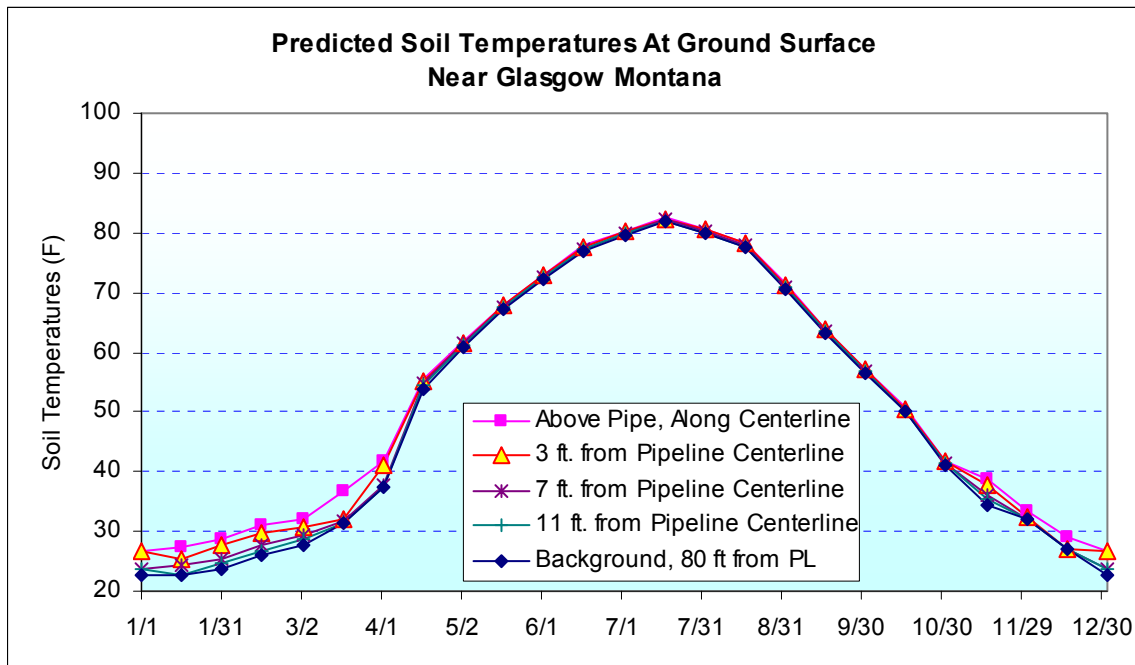


Figure 33

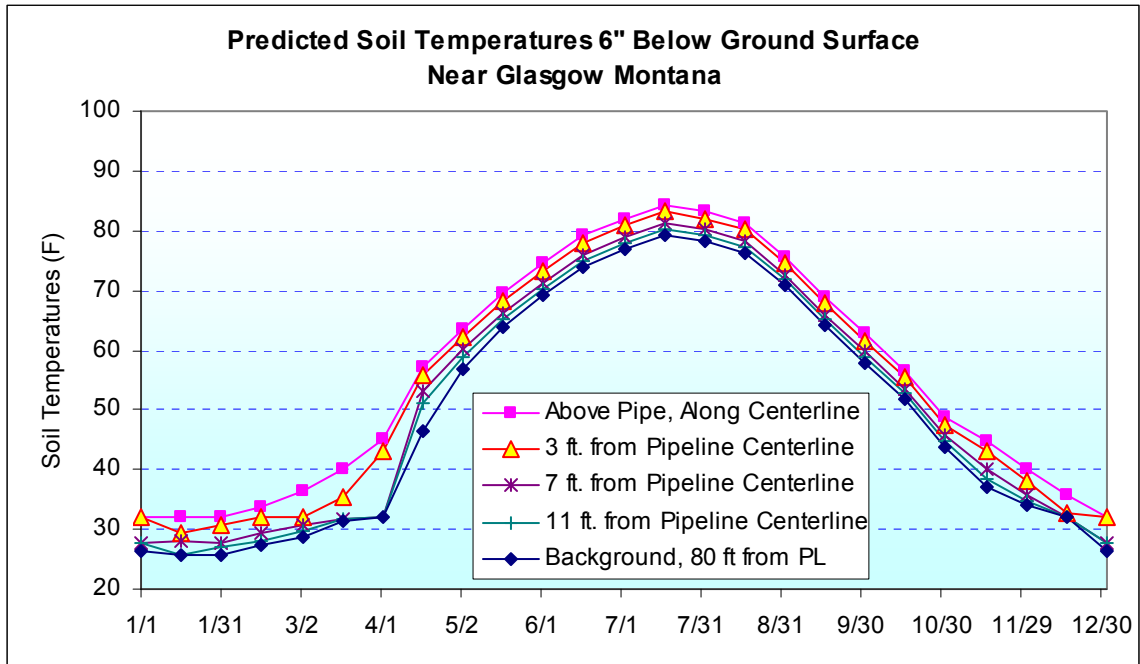


Figure 34

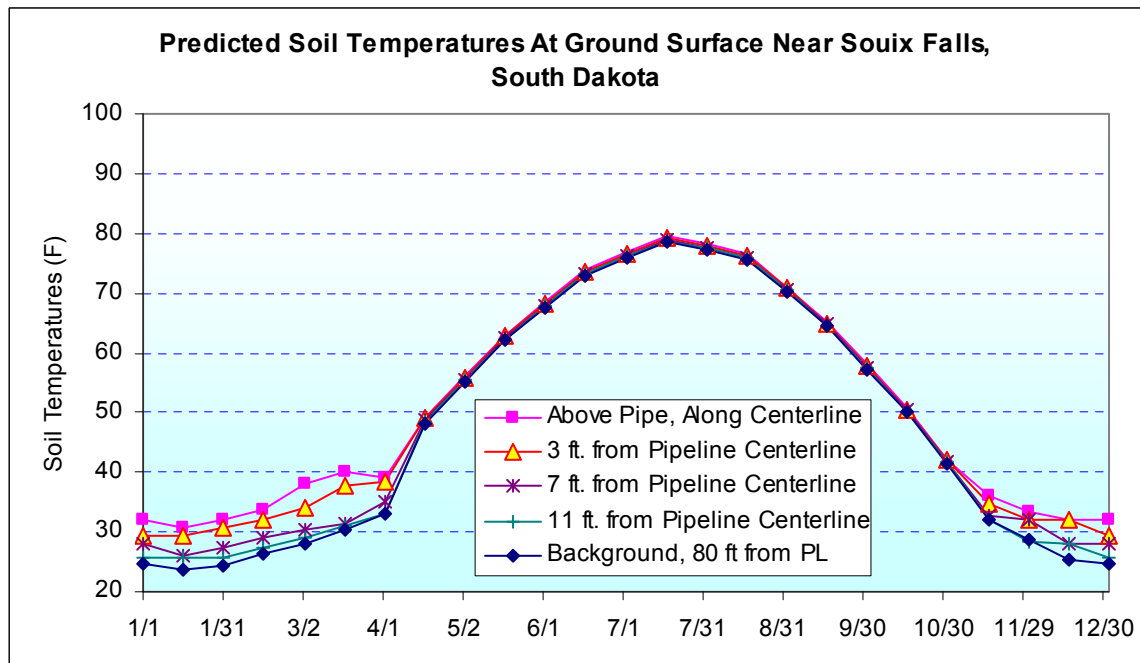


Figure 35

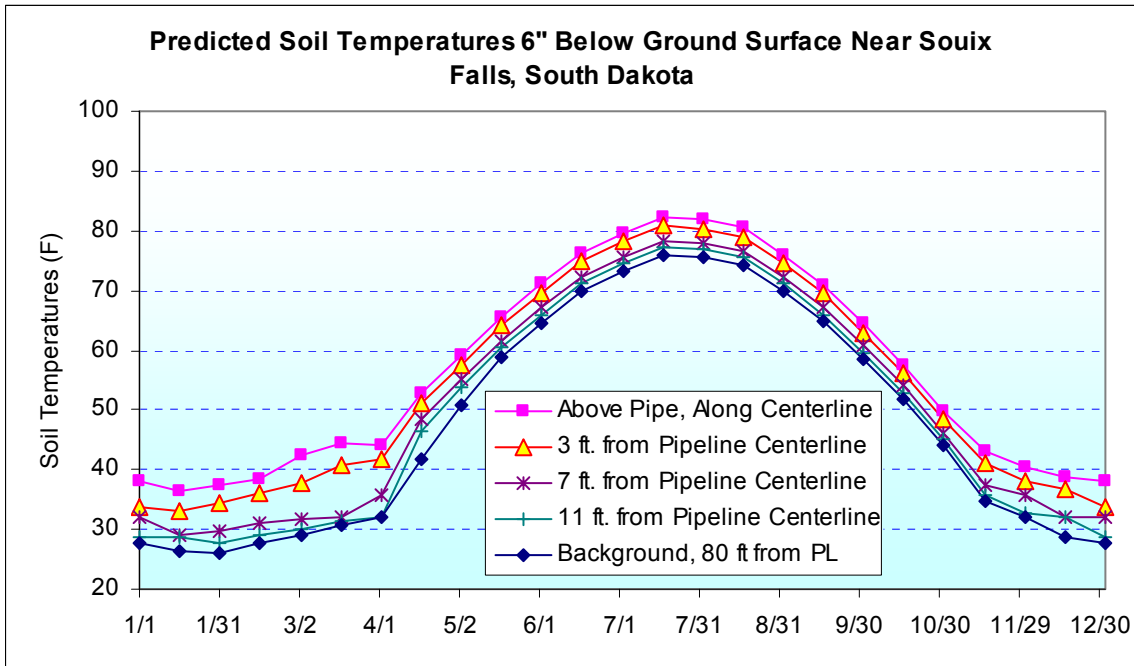


Figure 36

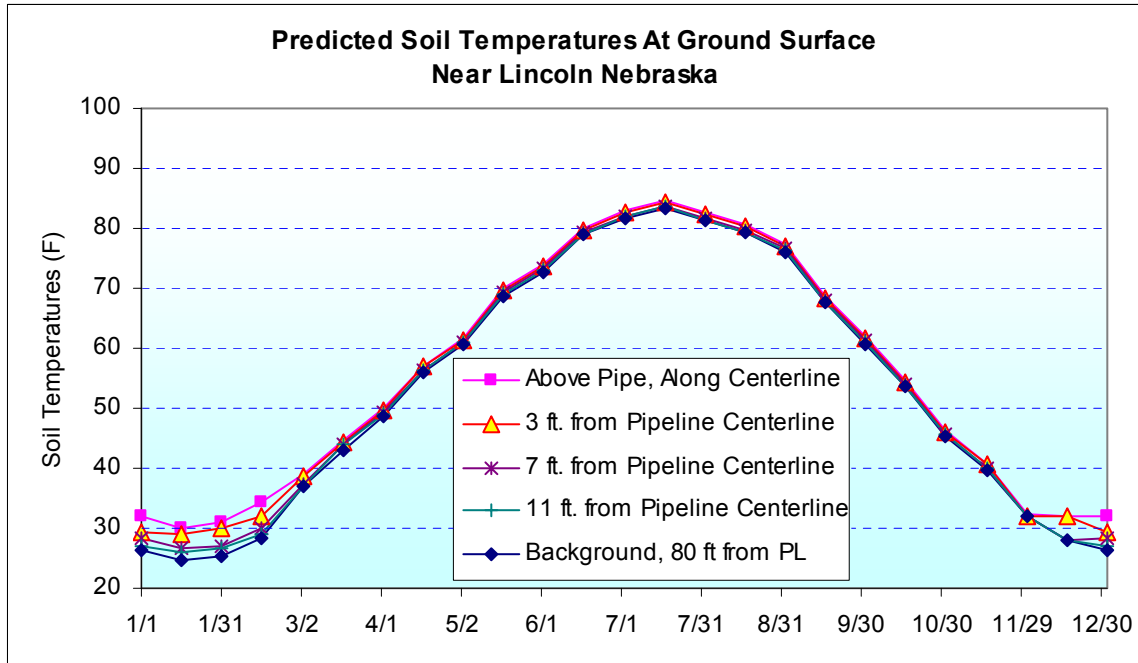


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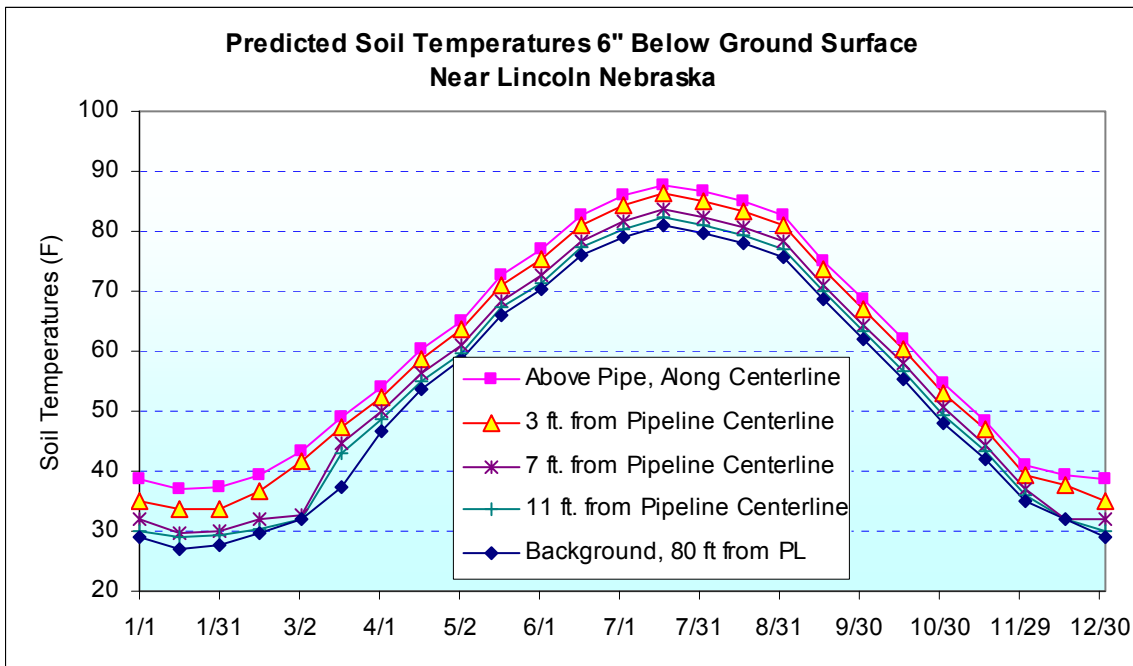


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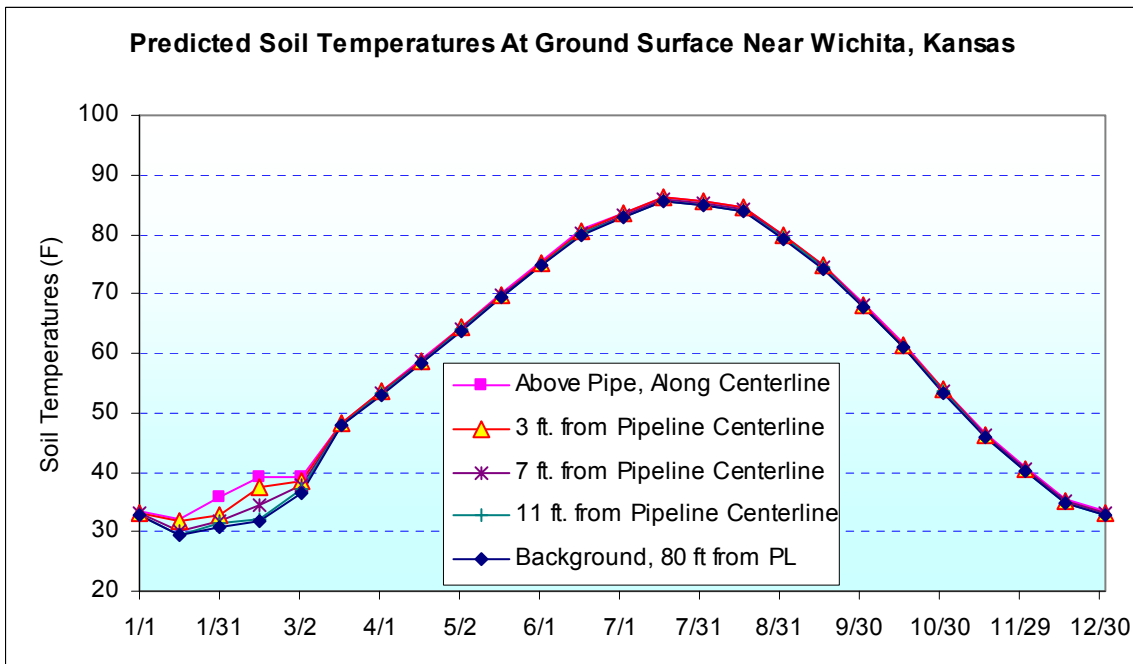


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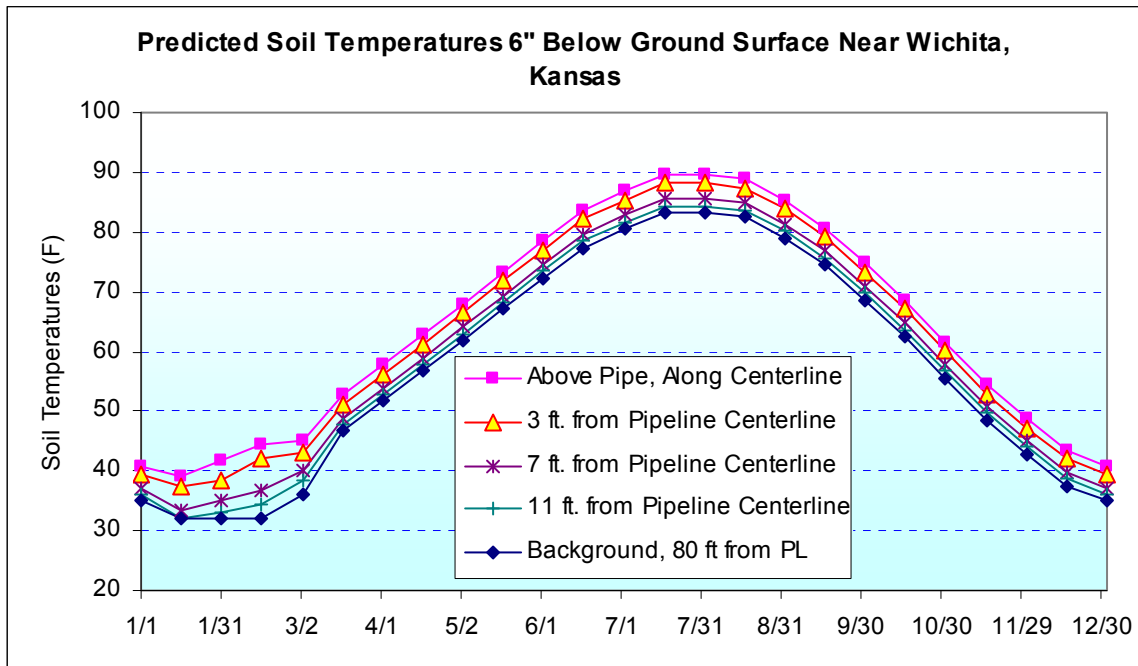


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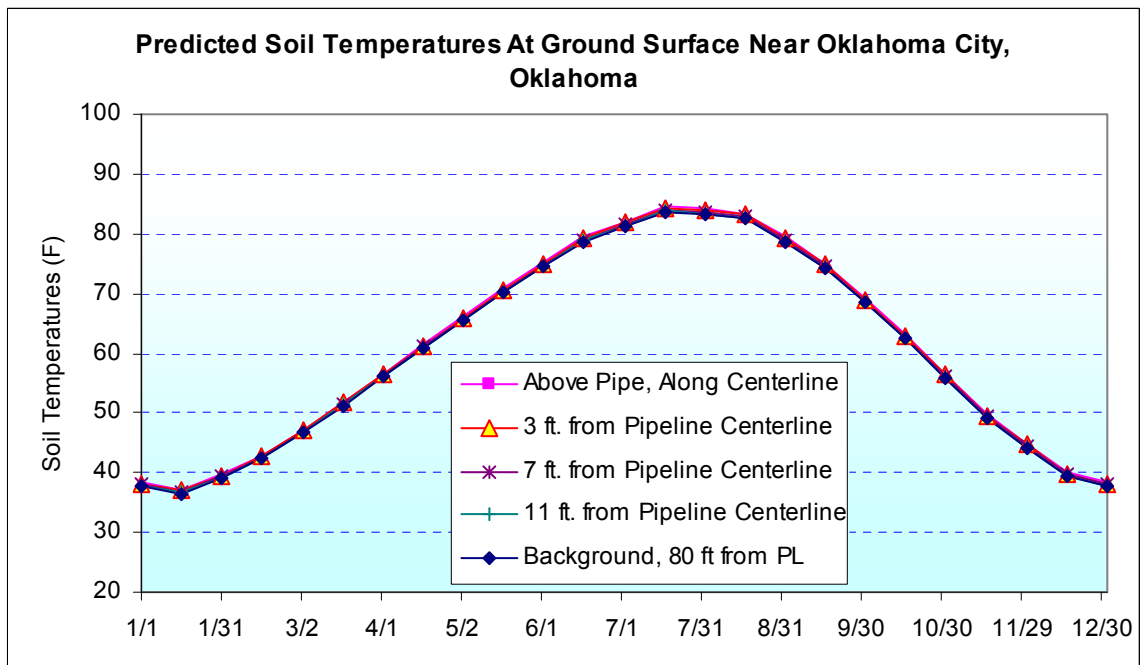


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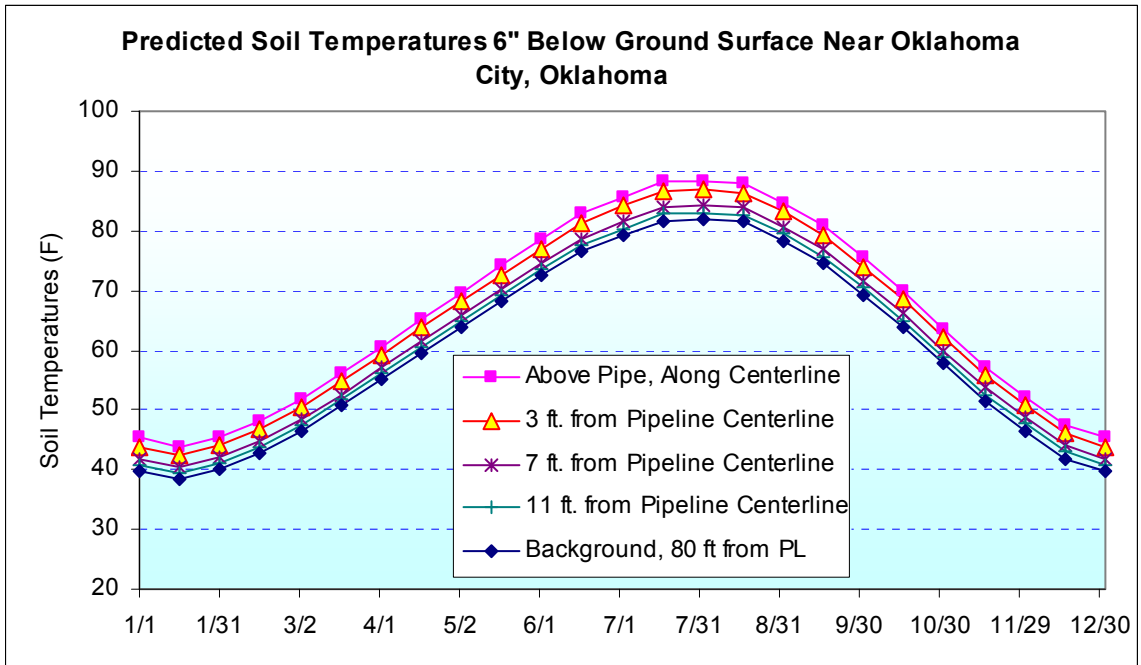


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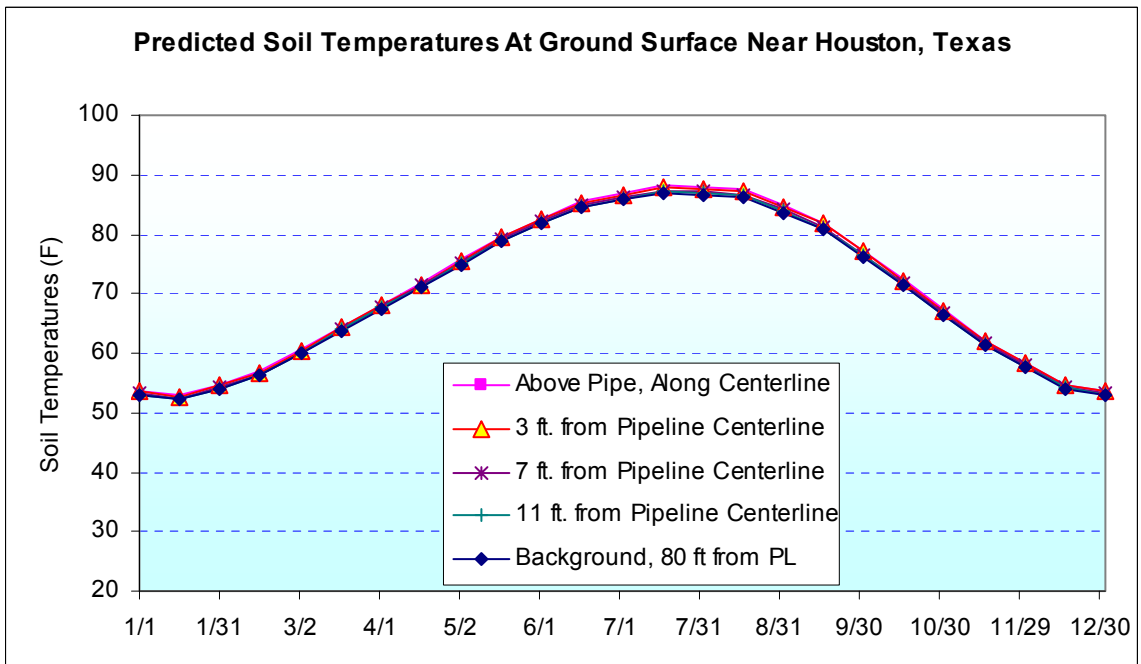


Figure 43

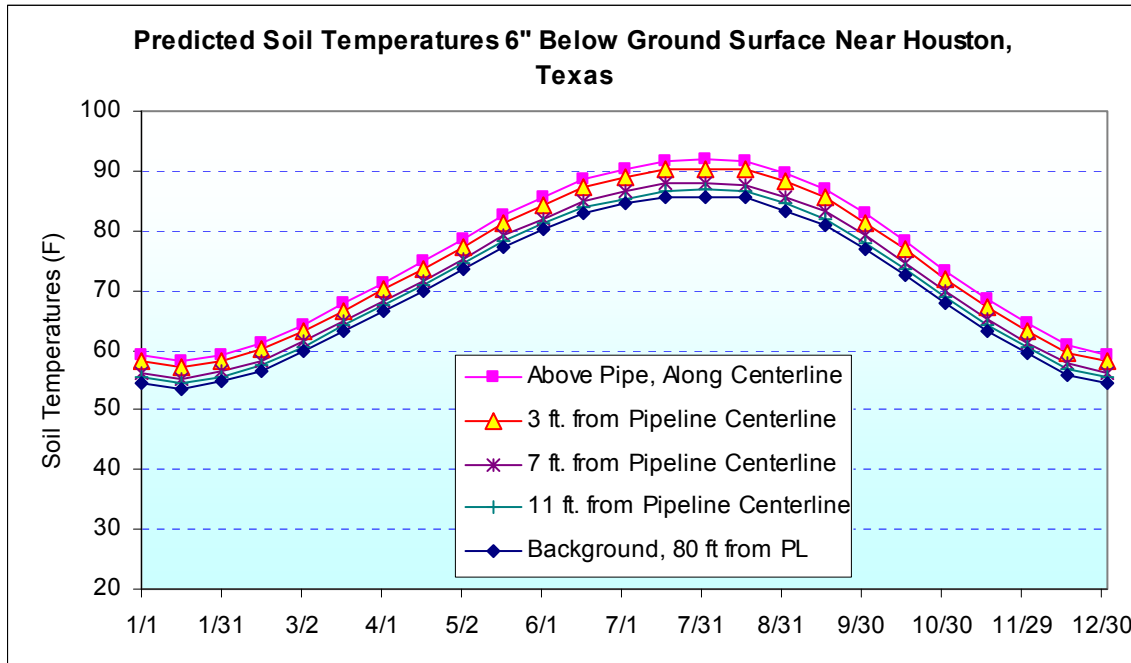


Figure 44

(e) **How many acres of land in total will experience significantly elevated soil temperatures?**

Based on the above data, Keystone does not anticipate that the operation of the pipeline will result in significant effects to surficial soil temperatures, particularly during the growing season.

(f) **How will crops and vegetation be affected by any increased temperature?**

Pipeline operation will modify soil temperatures in an area surrounding the pipe. Temperature profiles indicate that the effects of pipeline-elevated soil temperatures vary seasonally and are minor near the surface where most root zones lie. Potential positive vegetation responses to increased soil temperatures may include accelerated seedling emergence and increased production over the trenchline. Potential negative vegetation responses to increased soil temperature may include decreased water availability and decreased production over the trenchline. To analyze the potential thermal effects of pipeline operation on vegetation, a variety of literature sources and vegetation experts with experience monitoring reclaimed pipelines were consulted. Findings are presented below by issue.

i. **Literature review of the effect of elevated soil temperature on vegetation.**

Limited information is available regarding the specific thermal effects of pipeline operation on vegetation (see Section ii); however, extensive research has been conducted to assess the effects of elevated soil temperatures in general on vegetation development and production. **Table 1** summarizes typical results and is organized according to common vegetation and crop types that would be crossed by the Project. These data describe common effects of soil temperature on plant growth. Specific vegetation response to soil temperature in each study were also influenced by factors such as soil type, soil moisture, weather, land management practices, or competition with other vegetation species.

Table 1 Effects of Elevated Soil Temperature on Typical Vegetation Crossed by the Keystone XL Pipeline

Vegetation/Crop Type and Experimental Soil Temperature Range	Enhanced Growth Effects	Negative Growth Effects
Big bluestem: Tall-grass prairie species (44° to 95° F) ^a	<ul style="list-style-type: none"> • Earlier germination and emergence. • Faster growth rate. • Higher net photosynthesis. • Greater total biomass. • Strong growth dependence on soil temperature 	<ul style="list-style-type: none"> • No negative effects reported although optimum soil temperatures for greatest biomass production were 77° F.
Various wetland species (41° to 86° F) ^b	<ul style="list-style-type: none"> • Stem density increased with increasing soil temperature. • Total and annual species richness positively correlated with temperature. 	<ul style="list-style-type: none"> • None reported although perennial species richness was unresponsive to temperature increases.
Spring Wheat (60° to 105° F) ^c	<ul style="list-style-type: none"> • Occasional higher soil moisture. • Occasional higher crop yield. 	<ul style="list-style-type: none"> • None reported.
Corn (50° to 105° F)	<ul style="list-style-type: none"> • Warmer early-season soil temperatures hasten plant emergence and development.^d • Optimum germination occurs at soil temperatures of • 85° F.^e • Yield increases with higher soil temperatures at planting (75° to 85° F).^f • Soil temperatures late in summer less important than air temperature.^f 	<ul style="list-style-type: none"> • None reported. Effect of high soil temperatures in late summer secondary to effects of high air temperature, low soil moisture, and corresponding drought.^f
Soybeans (50° to 109° F)	<ul style="list-style-type: none"> • Optimum soil temperatures for germination is 82° F.ⁱ • Soybean has competitive advantage over weeds when soil temperatures promote soybean germination.^j 	<ul style="list-style-type: none"> • None reported. Similar to corn, effect of high soil temperatures in late summer secondary to high air temperature, low soil moisture, and corresponding drought.^j

a (Delucia et al. 1992); b (Seabloom 1998); c (Dunn et al. pre-published draft); d (Bollero 1996); e (Parsons 2001); f (Riley 1957); i (Tyagi and Tripathi 1983); j (Berglund and Helms 2003).

ii. Literature review of the thermal effect of pipelines on soil temperature and vegetation.

Very few studies have been conducted to assess the thermal impacts of natural gas or crude oil pipeline operation on soil temperature and/or vegetation (Naeth et al. 1993, Fisher et al. 2000, Dunn et al. pre-published draft). Naeth et al. (1993) recorded soil temperatures at various depths over a natural gas pipeline in a Canadian mixed-grass prairie. Elevated winter soil temperatures were recorded below 24 inches, while summer soil temperatures were minimally affected by the pipeline, possibly due to decreased gas flow and increased air temperature. Negative effects on vegetation were not reported.

Fisher et al. (2000) reported increased stature and yield of alfalfa and corn over a natural gas pipeline in central New York. Temperatures fluctuated around the pipeline by season and distance from compressor stations. The ultimate reason for increased production over the pipeline could not be determined but may have been a combination of temperature and water availability.

The most comprehensive assessment of pipeline thermal effects on vegetation was completed on the natural gas Alliance Pipeline (Dunn et al. pre-published draft). Measurements of soil temperature, plant available soil water, and spring wheat and barley yield were completed upstream and downstream of a compressor station on the Alliance Pipeline in 2002, 2003, and 2004. Data collected from four sites downstream of a pump station (0.5 to 52 miles) were compared with a site 0.5 mile upstream of the compressor station at points directly over the trench, 6 and 43 feet away from the trench, and at different soil depths. Temperature varied from 60° F on the upstream side of the compressor station, to 105° F at 0.5 miles downstream of the compressor station. Temperature differences at these coolest and warmest points are shown in **Table 2**.

Table 2 Soil Temperature Differences Measured Over a Natural Gas Pipeline

Distance from Compressor Station	Temperature (° F) Difference over Pipe Compared to 6 feet away from Pipe at 6 to 12 Inch Depth	Temperature (° F) Difference over Pipe Compared to 43 Feet away from Pipe at 6 to 12 Inch Depth
0.5 Miles upstream (coolest point)	1.8 – 3.6	3.6 – 7.2
0.5 Miles downstream (warmest point)	5.4 – 9.0	14.4 – 18.0

Soil temperature difference is similar to what would occur on the Project. No significant differences were noted in plant available soil water or crop yield at any site with the exception that mean plant available soil water was significantly greater over the trench in 2002 than in adjacent areas. Data were collected under the drought conditions that existed in 2002, while precipitation and plant available soil water were normal to above normal in 2003 and 2004, respectively. It was anticipated that soil temperatures above the pipe might lead to increased soil drying, however, this was not documented. Increased soil temperature above the pipeline did not significantly affect plant available soil water or crop yield.

iii. Seasonal pipeline temperature profile and effect on vegetation.

Temperature contours shown in **Figures 3** through **45** indicate natural fluctuations in soil temperatures by season and latitude. Heat from the pipeline typically increases soil temperature 6 inches below the surface between 5° and 8° F above background levels; greater differences occur between January and April, particularly in northern latitudes. Early season temperature differences at northern latitudes are between 10° and 15° F directly over the pipeline compared to background levels. Seasonal differences as a result of pipeline heat are not noticeable in Oklahoma and Texas.

Temperature contours (**Figures 3 to 33**) change dramatically throughout the year as air temperature and soil temperature interact. Although temperature differences are most noticeable in early to mid-spring, the area of maximum temperature difference is restricted to immediately over the pipeline (**Figures 3 and 4 and 8 and 9**). Later spring and summer temperature profiles indicate that average surface temperatures continue through the soil profile in a zone around the pipeline (**Figures 5 and 6 and 10 and 11**). Late fall temperature profiles indicate that pipeline heat has minimal effect on surface conditions (**Figures 7 and 12**). In summary, heat effects from the pipeline would have the greatest impact on surface conditions, and potentially plant growth, in early to mid-spring at northern latitudes.

The roots of most annual crops occur within 1.4 feet of the soil surface at maturity (Merrill et al. 2002). Heat effects from the pipeline are less pronounced within this zone than near the pipe. Also, many crops in northern latitudes are seeded in spring or early summer when heat effects from the pipeline would be minimized by ambient weather conditions. Consequently, root development of spring-seeded plants would occur after pipeline heat effects have substantially dissipated in the rooting zone. The roots of fall-seeded plants, such as winter wheat, would have initiated root growth prior to winter dormancy. The amount of root growth would depend on planting date, soil type, cultivar, and weather (Fowler 2002). Heat effects from the pipeline would be negligible since heat is directed into lower soil profiles in the fall. However, increased early to mid-spring soil temperatures could hasten dormancy emergence in fall-seeded crops such as winter wheat whose roots are already partially developed. Earlier emergence can improve crop yields as shown in **Table 1**.

Elevated soil temperatures could affect other crop physiological functions. Winter wheat requires two cold-affected physiological responses: cold acclimation and vernalization, to achieve dormancy, survive low winter temperatures, and subsequently develop. Cold acclimation and vernalization require a period of fall growth when temperatures are between 30° and 60° F, with 40°F near optimum. If cold acclimation is prevented, plants may be damaged or killed by low winter temperatures. Similarly, if vernalization is prevented, poor heading and flowering will occur in the spring. Eight to ten weeks at the above temperatures is typically required for full cold acclimation and dormancy to be achieved. Vernalization requires approximately 40 days, but can vary from 30 to 60 days depending upon the wheat variety (Fowler 2002).

Based on the pipeline thermal modeling results, surface soil temperatures in September and October (when winter wheat is typically seeded) is primarily a function of air temperature. Optimal winter wheat seeding depth is less than 1 inch (Fowler 2002). Consequently, soil temperatures during initial wheat germination and growth, cold acclimation, and vernalization would be influenced by ambient conditions. Heat generated by the pipeline would not be a factor in cold acclimation and vernalization. Similarly, throughout the winter, heat from the pipeline is directed into the lower soil profiles. Soil surface temperatures and wheat dormancy will be affected by ambient temperatures, not heat from the pipeline.

Although positive effects on vegetation would likely result from elevated soil temperatures in early to mid-spring, potentially negative effects could occur later in the summer if pipeline-influenced soil temperatures promoted soil drying in concert with higher air temperatures. Underground hot-water pipelines (95° F) have been shown to promote germination and early season plant growth, but also deplete available moisture (Rykbost et al. 1975a,b). While it is possible that elevated soil temperature may promote soil drying, it is difficult to separate the effects of soil temperature from the influence of soil structure, soil conductivity, and mycorrhizal function on soil water availability and plant uptake (Killham 1994). Warm soils absorb water faster

than cold soils and therefore soil water may be more readily available to plants in warmer soils than in colder soils (Donohue et al. 1971). Rykbost (1975a, 1975b) found increased crop yields in heated soils with an irrigated water supply. However, most wet soils also evaporate water more quickly than do dry soils, which tend to promote soil cooling (<http://www.Newton.dep.anl.gov>). Consequently, although soils warmed by the pipeline may absorb more water and promote water infiltration, the greater amount of water moving through the trench could cool the trench soil profile more quickly than the surrounding soil, resulting in slower drying and a neutral impact on plant growth.

In summary, enhanced emergence and initial plant growth may be detected over the pipe centerline in early to mid-spring at northern latitudes since some plants are sensitive to increased soil temperatures during this stage of plant development. Positive or negative effects are unlikely to be measurable later in the growing season since post-emergent plant growth is more influenced by air temperature, day length, and soil moisture than soil temperature. While it is theoretically possible that heat from the pipeline may dehydrate soil moisture directly above the trench, the heated trench may absorb water more rapidly than adjacent soils. The additional water in the trench soil profile would then likely cool the soil more rapidly than in adjacent areas. Ultimately, the thermal effect of the pipeline on plant growth would typically be secondary to other environmental conditions as described in Section iv below.

iv. Land Management Practices Affect Soil Temperature

Although the pipeline will affect nearby soil temperatures, its impact will be confounded by surface land management practices. Crop rotation, grazing practices, and burning treatments influence soil temperature. Crop residues under different tillage systems and pasture utilization affect soil temperature by changing the degree of soil shading. Soil temperatures are often at least 2° F colder at 4-inch depth under cornstalk residue than on essentially bare soil (Mannering <http://www.ces.purdue.edu/extmedia/AY/AY-230>). Tillage systems were found to significantly affect soil temperature and corn emergence (Drury et al. 1999). Tillage systems also greatly affect soil moisture and soil fertility (Drury et al. 1999, Norwood 1999). Grazing and pasture burning influence soil temperatures by removing vegetation thereby decreasing shade and increasing evaporation. Studies in the tallgrass prairie indicate that burning, or burning and grazing in concert, increase soil temperatures by 20 to 50 percent over unburned and/or ungrazed areas (Knapp et al. 1998). Consequently, although heat generated by the pipeline will affect nearby soils and potentially vegetation, land management practices will greatly influence any measurable effect of the pipeline.

v. Revegetation Monitoring Results on Pipelines

Four years of revegetation monitoring were conducted on the 515-mile Express crude-oil pipeline in Montana and Wyoming. Specific success criteria were defined for native vegetation and Conservation Reserve Program (CRP) fields. Success criterion in native vegetation was defined as achieving 90 percent cover of desirable perennial species compared to adjacent areas within 5 years. Success criteria for CRP fields were defined as stable soils and comparable species composition to adjacent conditions. Following four years of monitoring, revegetation success in native vegetation types had been achieved on approximately 97 percent of the pipeline right-of-way and in all but two CRP fields (WESTECH Environmental Services 1998, 1999, 2000, 2001). After 8 years, all revegetated areas had achieved the success criteria (Larsen, pers. com.).

vi. Summary

Pipeline heat may influence spring growth and production. Positive effects of elevated soil temperature on plant emergence and production have been documented. Negative effects of elevated soil temperature on plant physiology have not been documented at the temperatures that would be generated by the pipeline. The limited number of studies that have been completed on the heat effects of pipelines on vegetation indicate neutral to positive effects. Accordingly, Keystone does not anticipate any significant overall effect to crops and vegetation associated with heat generated by the operating pipeline.

Negative impacts of pipeline construction on post-construction vegetation are typically due to factors other than heat generation including:

- Soil compaction from equipment operation;
- Pipeline trench subsidence;
- Mixed soil horizons/topsoil degradation;
- Poor seed bed preparation; and
- Poorly adapted species used in revegetation.

These types of impacts can be avoided or mitigated through the use of construction, reclamation, and revegetation Best Management Practices (BMPs). Keystone has developed specific construction, reclamation, monitoring, and operational BMPs to insure successful reclamation and revegetation as detailed in the Project Construction, Mitigation, and Reclamation Plan (**Appendix I**). These types of BMPs have been applied by industry partners on thousands of miles of pipelines throughout the United States and Canada and have resulted in successful reclamation of pipeline rights of way that is equivalent to the land capability of adjacent undisturbed areas.

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APPENDIX T

Literature Review

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LITERATURE REVIEW

This section briefly describes the results of a review of relevant peer-reviewed literature on climate change effects. This review includes summary descriptions of the literature reviewed, the greenhouse gas emissions scenarios considered and their applicability to the proposed Project, and an overview explanation of the methodological and analytical steps taken by the respective authors to develop climate change projections.

There is a variety of existing sources of downscaled climate research for the states, regions, and in some cases specific areas where the proposed Project would be constructed. The body of research on climate change is evolving in the United States. As part of this assessment, input from regional, state-designated climate experts was solicited to locate the most current and relevant sources. Though many projects are under development including dynamic downscaling,¹ much of that information has not yet been published. There is also a growing number of web-based platforms for generating downscaled climate impacts for user-defined geographies.

The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Intergovernmental Panel on Climate Change (IPCC 2007)

The Intergovernmental Panel on Climate Change (IPCC) predicts global climate change effects using a number of models and GHG scenarios. While uncertainty about the exact magnitude and rates of climate change exists, there is general agreement on expected climate and weather-pattern changes. This report includes the contributions of 676 authors and cites over 6,000 peer-reviewed scientific publications in an effort to present a comprehensive synthesis of predicted climate change.

Global Climate Change Impacts in the U.S., United States Global Change Research Program (USGCRP 2009)

The United States Global Change Research Program (USGCRP) provides downscaled model results for the United States from CMIP3-A (Coupled Model Intercomparison Project) and CMIP3-C. It also provides some general global projections, projections for all of the United States, and projections for some subregions with varying degrees of detail.

Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC 2012)

This report reviews existing studies, multiple global climate models, and multiple regional climate models. Confidence levels are conferred based on the reliability and relative agreement between the sources. In addition, likelihood assessments review the direction of change.

¹ Dynamic downscaling fits output from general circulation models into regional meteorological models. It uses numerical meteorological modeling to project how global patterns affect local weather conditions. This process generally achieves more accurate results, but is very data intensive.

High Resolution Interpolation of Climate Scenarios for the Conterminous USA and Alaska Derived from General Circulation Model Simulations (Joyce et al. 2011)

This report uses statistical downscaling to compare outputs from the following global circulation models for North America:

- CGCM31MR (Canadian Third Generation Coupled Global Climate Model, version 3.1, medium resolution);
- CSIRO Mk3.5 (the Commonwealth Scientific and Industrial Research Organisation Mk3.5 Climate Model);
- MIROC3.2MR (Model for Interdisciplinary Research on Climate, version 3.2, medium resolution); and
- NCAR CCSM3 (U.S. National Center for Atmospheric Research Community Climate Model version 3.0).

The data were processed through the ANUSPLIN model to create gridded data for each variable. The report compares the outputs of each model and then averages the results from all the downscaled models. These results are displayed in Table 1. The report examines several subregions: the dry temperate climate region, prairie climate region, continental climate region, and subtropical climate region (see the Supplemental EIS, Figure 4.13.1-2). A summary of the average model outputs for each of the climate regions is presented in Tables 1 to 4.

Table 1 Climate Change Projection Summary for the Dry Temperate Climate Region

Climate Variable	----- A2 Emissions Scenario -----					----- A1B Emissions Scenario -----					----- B1 Emissions Scenario -----				
Mean Daily T_{min} (°C)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	-1.13	10.30	0.20	-10.59	-0.32	-1.08	10.30	0.21	-10.60	-0.31	-1.14	10.33	0.11	-10.71	-0.36
Change by 2010-2039	0.74	1.20	0.96	0.98	1.00	1.25	1.39	1.08	1.33	1.28	1.04	1.06	1.03	0.99	1.04
Change by 2040-2069	2.27	2.77	2.53	2.59	2.52	2.36	2.81	2.49	2.65	2.58	1.66	1.86	1.89	2.14	1.89
Change by 2070-2099	3.88	4.63	4.16	4.14	4.22	3.07	3.80	3.58	3.62	3.52	2.12	2.46	2.53	2.84	2.49
100-year forcing	4.02	4.91	4.48	4.61	4.51	3.25	4.08	3.91	4.08	3.82	2.26	2.77	2.77	3.20	2.74
100-year variability (%)	1.14	76.08	30.36	0.44	47.74	-6.32	20.16	-14.51	0.17	-1.45	-21.79	7.72	-5.54	-5.79	-9.36
Mean Daily T_{max} (°C)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	13.90	28.01	16.22	2.39	15.12	13.96	28.00	16.18	2.40	15.12	13.94	28.08	16.05	2.34	15.08
Change by 2010-2039	0.86	1.45	0.86	0.73	1.00	1.42	1.66	1.20	1.02	1.34	1.07	1.26	1.23	0.74	1.09
Change by 2040-2069	2.51	3.06	2.62	2.10	2.56	2.56	3.04	2.56	2.14	2.58	1.70	1.95	1.90	1.65	1.81
Change by 2070-2099	4.31	4.88	4.32	3.50	4.27	3.27	4.12	3.81	3.00	3.56	2.18	2.52	2.71	2.28	2.43
100-year forcing	4.48	5.23	4.73	3.85	4.57	3.51	4.46	4.18	3.36	3.86	2.39	2.94	2.94	2.58	2.70
100-year variability (%)	8.13	38.52	18.37	19.16	44.31	-3.83	5.19	-10.41	23.07	1.43	-13.36	8.34	-12.25	8.52	3.47
Total Precipitation (mm)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	124	135	91	75	425	124	135	92	75	425	124	135	92	75	425
Change by 2010-2039	4	1	4	3	12	4	-2	2	2	6	6	0	-1	2	7
Change by 2040-2069	7	-2	2	6	12	6	5	4	7	22	10	5	4	6	25
Change by 2070-2099	6	3	3	12	24	10	0	2	11	23	10	6	0	8	24
100-year forcing	7	3	3	13	26	11	1	2	12	25	10	7	1	8	26
100-year variability (%)	10.52	4.74	12.62	13.86	2.72	-8.31	-2.21	5.72	4.77	-7.73	9.32	4.54	-1.26	20.03	7.40
Mean Windspeed (m s ⁻¹)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	4.39	3.83	3.70	3.88	3.95	4.36	3.84	3.71	3.85	3.94	4.35	3.87	3.75	3.87	3.96
Change by 2010-2039	0.04	0.02	0.09	-0.01	0.04	-0.15	0.08	0.09	0.01	0.02	-0.14	0.03	0.02	-0.07	-0.03
Change by 2040-2069	0.01	0.13	0.06	0.02	0.05	-0.09	0.02	0.11	-0.02	0.01	-0.06	-0.06	0.02	0.03	-0.02
Change by 2070-2099	-0.01	0.20	0.07	-0.05	0.05	0.00	-0.01	0.06	0.03	0.03	-0.18	-0.07	-0.02	-0.02	-0.07
100-year forcing	0.02	0.19	0.04	-0.03	0.05	0.00	-0.01	0.05	0.02	0.02	-0.19	-0.03	0.01	-0.01	-0.06
100-year variability (%)	0.42	36.79	-18.66	-5.85	-16.26	-8.78	6.47	-22.23	-8.06	-20.87	5.37	9.38	-11.43	-3.67	-2.17

Source: Joyce et al. 2011.

Mean Daily T_{min} (°C) = the average minimum temperature each day. °C = degrees Celsius.

Mean Daily Tmax (°C) = the average maximum temperature each day.

Change = average net change for the 30-year mean relative to the 1980-2009 baseline.

100-year forcing = the 100-year forcing is the changes in the means (for temperature and precipitation) of 1970-1999 and 2070-2099. This is the projected change in climate over 100 years.

100-year variability (%) = the change in the 30-year standard deviations relative to a 1970-1999 baseline.

Table 2 Climate Change Projection Summary for the Prairie Climate Region

Climate Variable	----- A2 Emissions Scenario -----					----- A1B Emissions Scenario -----					----- B1 Emissions Scenario -----				
Mean Daily T_{min} (°C)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	6.22	18.13	7.53	-6.28	6.38	6.25	18.27	7.55	-6.36	6.42	6.29	18.30	7.53	-6.27	6.44
Change by 2010-2039	0.87	1.22	1.12	0.96	1.06	1.14	1.36	1.31	1.32	1.30	0.69	1.05	1.07	0.76	0.91
Change by 2040-2069	2.17	2.68	2.77	2.34	2.48	2.27	2.54	2.65	2.50	2.49	1.50	1.63	1.90	1.80	1.72
Change by 2070-2099	3.66	4.57	4.55	3.89	4.18	2.98	3.49	3.62	3.55	3.41	1.80	2.21	2.40	2.40	2.21
100-year forcing	3.80	4.78	4.91	4.38	4.46	3.17	3.83	4.00	3.96	3.73	2.02	2.59	2.76	2.90	2.55
100-year variability (%)	27.94	34.75	35.07	-7.48	36.13	-6.49	13.35	1.76	-8.01	-5.36	1.08	-2.32	10.48	-14.87	-9.71
Mean Daily T_{max} (°C)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	18.92	30.95	20.34	5.09	18.81	18.98	31.20	20.37	5.04	18.89	19.04	31.28	20.26	5.09	18.90
Change by 2010-2039	1.00	1.50	1.22	0.82	1.15	1.14	1.52	1.55	1.16	1.36	0.74	1.17	1.35	0.66	1.00
Change by 2040-2069	2.22	2.91	2.92	2.21	2.56	2.43	2.61	2.76	2.45	2.56	1.45	1.48	2.20	1.72	1.73
Change by 2070-2099	3.90	4.79	4.71	3.85	4.33	3.19	3.60	3.88	3.49	3.54	1.82	2.17	2.77	2.31	2.27
100-year forcing	4.04	4.91	5.07	4.24	4.56	3.39	3.97	4.28	3.82	3.85	2.07	2.61	3.05	2.69	2.59
100-year variability (%)	15.26	20.78	27.28	14.83	39.52	-5.79	6.84	1.28	11.84	3.29	0.81	1.86	7.11	3.47	4.46
Total Precipitation (mm)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	261	284	228	120	891	258	273	228	121	881	260	271	231	120	881
Change by 2010-2039	3	-6	5	1	4	10	-4	-3	2	5	12	-3	-9	-1	1
Change by 2040-2069	21	-13	8	-3	15	13	10	4	-7	20	22	24	-1	0	46
Change by 2070-2099	9	-5	9	0	14	25	15	3	-1	42	23	17	-7	-2	33
100-year forcing	15	7	9	2	33	28	17	4	2	50	28	17	-3	0	42
100-year variability (%)	-2.42	10.70	5.68	12.84	2.53	0.93	15.03	-1.33	13.92	-10.87	4.57	8.35	-6.56	3.75	4.10
Mean Windspeed (m s ⁻¹)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	4.75	3.85	4.06	4.53	4.30	4.71	3.86	4.10	4.53	4.29	4.72	3.84	4.11	4.56	4.30
Change by 2010-2039	0.27	0.03	0.17	0.07	0.13	0.08	0.17	0.00	0.05	0.08	0.05	0.12	0.07	-0.05	0.05
Change by 2040-2069	0.34	0.17	0.14	0.18	0.20	0.23	0.14	0.19	0.10	0.17	0.18	0.11	0.07	0.12	0.13
Change by 2070-2099	0.55	0.38	0.32	0.20	0.37	0.29	0.15	0.18	0.07	0.18	0.11	0.21	-0.03	0.04	0.08
100-year forcing	0.58	0.41	0.34	0.23	0.39	0.27	0.19	0.23	0.11	0.20	0.10	0.23	0.03	0.10	0.11
100-year variability (%)	4.48	17.44	8.04	5.69	5.12	-11.18	12.89	-0.38	-4.47	-11.19	2.24	21.88	13.55	-0.45	9.81

Source: Joyce et al. 2011.

Mean Daily Tmin (°C) = the average minimum temperature each day. °C = degrees Celsius.

Mean Daily Tmax (°C) = the average maximum temperature each day.

Change = average net change for the 30-year mean relative to the 1980-2009 baseline.

100-year forcing = the 100-year forcing is the changes in the means (for temperature and precipitation) of 1970-1999 and 2070-2099. This is the projected change in climate over 100 years.

100-year variability (%) = the change in the 30-year standard deviations relative to a 1970-1999 baseline.

Table 3 Climate Change Projection Summary for the Continental Climate Region

Climate Variable	-----A2 Emissions Scenario-----					-----A1B Emissions Scenario-----					-----B1 Emissions Scenario-----				
Mean Daily T_{min} (°C)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	2.75	14.80	5.11	-8.45	3.54	2.79	14.89	5.12	-8.50	3.56	2.91	14.89	5.18	-8.32	3.64
Change by 2010-2039	1.00	1.08	1.16	1.10	1.10	1.13	1.18	1.31	1.43	1.28	0.61	0.93	0.91	0.74	0.82
Change by 2040-2069	2.34	2.54	2.63	2.63	2.52	2.40	2.45	2.60	2.76	2.55	1.67	1.64	1.78	1.92	1.77
Change by 2070-2099	3.87	4.29	4.35	4.28	4.21	3.23	3.29	3.39	3.91	3.46	1.99	2.20	2.21	2.39	2.21
100-year forcing	4.07	4.50	4.67	4.71	4.48	3.48	3.60	3.72	4.29	3.76	2.35	2.50	2.60	2.95	2.59
100-year variability (%)	17.22	17.80	25.65	-6.08	26.31	-17.73	-10.29	4.27	-10.09	-7.63	-11.76	-21.56	6.12	-15.03	-15.21
Mean Daily T_{max} (°C)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	15.51	27.60	17.15	2.21	15.60	15.55	27.78	17.18	2.16	15.66	15.68	27.83	17.21	2.31	15.74
Change by 2010-2039	1.06	1.17	1.16	0.77	1.05	1.14	1.24	1.41	1.07	1.23	0.68	1.01	1.06	0.44	0.82
Change by 2040-2069	2.36	2.80	2.80	2.13	2.52	2.49	2.51	2.65	2.24	2.47	1.59	1.46	1.84	1.53	1.62
Change by 2070-2099	4.01	4.55	4.50	3.69	4.20	3.25	3.39	3.49	3.34	3.37	1.94	2.23	2.39	1.99	2.15
100-year forcing	4.21	4.65	4.65	3.99	4.41	3.49	3.67	3.66	3.59	3.64	2.30	2.56	2.79	2.39	2.50
100-year variability (%)	23.32	13.30	30.83	20.34	40.54	-11.59	1.92	5.01	10.74	5.43	2.18	-5.47	4.24	2.37	-1.84
Total Precipitation (mm)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	288	311	252	203	1054	289	304	253	204	1050	287	300	254	203	1044
Change by 2010-2039	9	-1	6	5	17	11	3	7	3	26	7	1	-1	2	12
Change by 2040-2069	18	-11	4	16	28	11	7	8	8	35	23	23	11	8	65
Change by 2070-2099	18	-5	18	23	55	28	10	6	23	70	29	10	2	15	58
100-year forcing	25	7	18	24	74	36	16	8	25	85	35	12	5	15	67
100-year variability (%)	15.89	4.81	17.79	27.27	19.52	0.60	-2.87	0.24	34.85	-3.04	5.66	-6.56	-3.41	23.17	1.56
Mean Windspeed (m s ⁻¹)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	4.07	3.15	3.52	4.15	3.72	4.04	3.20	3.54	4.15	3.73	4.05	3.13	3.55	4.19	3.73
Change by 2010-2039	0.24	-0.06	0.01	0.14	0.08	0.00	0.02	-0.07	0.11	0.02	0.00	-0.02	-0.06	-0.05	-0.03
Change by 2040-2069	0.23	0.01	-0.02	0.26	0.13	0.14	-0.07	-0.06	0.11	0.04	0.12	0.02	-0.03	0.11	0.06
Change by 2070-2099	0.41	0.01	-0.01	0.28	0.18	0.23	-0.05	-0.05	0.13	0.07	0.05	0.02	-0.10	0.09	0.02
100-year forcing	0.44	0.00	0.01	0.33	0.19	0.23	0.00	-0.01	0.20	0.10	0.06	0.00	-0.04	0.18	0.05
100-year variability (%)	5.64	-8.38	23.57	5.51	-0.24	-1.18	-2.16	8.19	2.38	-6.17	-0.12	-1.59	14.14	6.17	5.96

Source: Joyce et al. 2011.

Mean Daily T_{min} (°C) = the average minimum temperature each day. °C = degrees Celsius.Mean Daily T_{max} (°C) = the average maximum temperature each day.

Change = average net change for the 30-year mean relative to the 1980-2009 baseline.

100-year forcing = the 100-year forcing is the changes in the means (for temperature and precipitation) of 1970-1999 and 2070-2099. This is the projected change in climate over 100 years.

100-year variability (%) = the change in the 30-year standard deviations relative to a 1970-1999 baseline.

Table 4 Climate Change Projection Summary for the Subtropical Climate Region

Climate Variable	----- A2 Emissions Scenario -----					----- A1B Emissions Scenario -----					----- B1 Emissions Scenario -----				
Mean Daily T_{min} (°C)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	11.06	20.39	12.18	2.30	11.47	11.11	20.46	12.20	2.23	11.49	11.10	20.47	12.21	2.30	11.51
Change by 2010-2039	0.89	1.05	1.06	0.57	0.90	0.99	1.05	1.28	0.81	1.04	0.64	0.92	0.93	0.38	0.74
Change by 2040-2069	2.01	2.31	2.47	1.51	2.08	1.95	2.21	2.39	1.57	2.03	1.49	1.45	1.73	1.05	1.44
Change by 2070-2099	3.23	3.92	4.15	2.74	3.52	2.73	3.04	3.15	2.53	2.87	1.79	1.97	2.14	1.43	1.85
100-year forcing	3.39	4.10	4.44	3.00	3.73	2.95	3.29	3.46	2.73	3.10	1.99	2.24	2.47	1.70	2.10
100-year variability (%)	22.75	36.98	32.24	26.36	53.39	-1.67	2.43	7.16	3.85	9.85	4.22	-0.45	11.09	-0.13	3.11
Mean Daily T_{max} (°C)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	24.49	32.39	25.32	14.77	24.23	24.58	32.56	25.40	14.71	24.31	24.61	32.64	25.43	14.77	24.35
Change by 2010-2039	0.97	1.20	1.06	0.54	0.95	0.96	1.06	1.20	0.69	0.98	0.57	0.99	0.89	0.33	0.71
Change by 2040-2069	2.06	2.72	2.51	1.51	2.20	2.06	2.32	2.30	1.62	2.07	1.32	1.26	1.57	1.06	1.31
Change by 2070-2099	3.40	4.42	4.16	2.85	3.72	2.68	3.22	3.17	2.58	2.91	1.65	1.92	2.13	1.50	1.81
100-year forcing	3.55	4.47	4.42	3.07	3.87	2.91	3.43	3.51	2.74	3.14	1.91	2.22	2.50	1.72	2.08
100-year variability (%)	20.75	9.47	37.75	15.99	37.14	-5.84	-2.47	7.12	1.34	-3.13	8.53	8.96	8.86	-3.31	6.17
Total Precipitation (mm)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	354	376	287	334	1351	346	368	281	335	1329	347	363	280	334	1324
Change by 2010-2039	-16	-17	6	-3	-28	-4	-11	20	-5	2	10	-10	8	-8	4
Change by 2040-2069	-10	-44	5	-2	-49	-3	-16	12	-13	-20	16	10	20	-2	45
Change by 2070-2099	-13	-51	6	-28	-84	26	-13	5	-10	11	26	-7	17	-5	33
100-year forcing	-1	-42	8	-26	-61	30	-12	1	-7	13	30	-11	12	-4	29
100-year variability (%)	12.34	-16.95	-5.07	7.01	-3.34	1.82	-6.78	3.28	16.61	-13.07	22.02	2.78	1.17	19.33	-0.66
Mean Windspeed (m s ⁻¹)	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year	Spring	Summer	Fall	Winter	Year
Baseline 1980-2009	3.74	2.77	3.11	3.68	3.33	3.74	2.79	3.11	3.68	3.33	3.78	2.78	3.11	3.69	3.34
Change by 2010-2039	0.13	0.06	0.03	0.01	0.06	0.08	0.05	-0.02	-0.05	0.02	-0.10	0.04	0.00	-0.04	-0.02
Change by 2040-2069	0.17	0.13	0.07	0.02	0.09	0.11	0.09	0.07	0.05	0.08	0.07	0.12	-0.04	0.08	0.06
Change by 2070-2099	0.26	0.24	0.10	0.13	0.18	0.09	0.12	0.01	0.02	0.06	-0.01	0.09	-0.02	0.05	0.03
100-year forcing	0.27	0.24	0.15	0.19	0.21	0.11	0.14	0.06	0.09	0.10	0.05	0.10	0.03	0.13	0.08
100-year variability (%)	-6.32	-20.45	1.09	-2.86	-27.61	-8.37	-11.92	6.57	-3.94	-14.94	-2.69	4.19	5.37	-5.46	-20.64

Source: Joyce et al. 2011.

Mean Daily T_{min} (°C) = the average minimum temperature each day. °C = degrees Celsius.

Mean Daily T_{max} (°C) = the average maximum temperature each day.

Change = average net change for the 30-year mean relative to the 1980-2009 baseline.

100-year forcing = the 100-year forcing is the changes in the means (for temperature and precipitation) of 1970-1999 and 2070-2099. This is the projected change in climate over 100 years.

100-year variability (%) = the change in the 30-year standard deviations relative to a 1970-1999 baseline.

West-Wide Climate Risk Assessments: Bias-Corrected and Spatially Downscaled Surface Water Projections, United States Bureau of Reclamation (USBR 2011a and 2011b)

Sixteen global circulation models formed the basis of the climate projections used in this study. The study uses a downscaling technique known as the Bias Correction and Spatial Disaggregation approach, developed by Wood in 2002, to apply the CLIP3 projections at a watershed scale. This was done for the B1 (low), A1B (medium), and A2 (high) scenarios. This provided information on the extremes with lower probability but higher risk. The results focused on the Missouri watershed, which includes parts of the states of Montana, North Dakota, South Dakota, Nebraska, and Kansas.

CLIMATE MODELING

SCENARIOS

Current climate modeling to project future climate change effects uses scenarios of GHG emissions levels in the atmosphere. The IPCC created a number of scenarios for GHG emissions; these are dependent on assumptions regarding population and economic growth, as well as technology for fuel use and fuel production. These determine the degree and severity of predicted climate change effects. The four scenarios selected for this analysis in the 2007 IPCC report are described as follows:

- The A2 scenario is a heterogeneous world with high population growth rates and slow rates of economic development and technological innovation.
- The A1B scenario assumes rapid economic growth, and a world population that peaks around 2050. Technological innovation and adoption of energy-efficient technologies is balanced and does not rely on any one energy source.
- The A1F1 scenario assumes rapid economic growth, and a world population that peaks around 2050. Technological innovation and adoption of energy-efficient technologies is fossil intensive.
- The B1 scenario assumes very rapid economic growth, a world population that peaks around 2050, and a very fast innovation and adoption of energy-efficient technologies. The economy makes rapid changes toward services and information.

The IPCC has not assigned probabilities to any of these scenarios, but instead provides them for use in models to examine the entire range of possibilities and evaluate consequences based on the greenhouse gas emissions implicit in these combinations of population, economic activity, and technological innovation. The A2, A1B, and B1 scenarios (Figure 4.13.1-1) were analyzed in various models presented in the studies reviewed. In the Fifth Assessment Report (expected in approximately 2014), the IPCC plans to provide a greater range of emissions scenarios.

GLOBAL CIRCULATION MODELS

Global Circulation Models are still in the domain of active research and are therefore the subject of further investigation and improvement themselves. Consequently, such models may vary in spatial and temporal resolution, the numerical methods employed to solve sets of coupled differential equations, the initial conditions, and sub-grid-cell parameterization of processes that are too small-scale for explicit numerical treatment.

DOWNSCALING

Climate change studies are based on global models that are downscaled for regional application. The global model results for temperature, precipitation, solar gain, and wind are disaggregated for the scale of interest and then refined based on topographical features and historical trends. The scale of interest for the downscaling determines the level of detail available from the study.

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APPENDIX U

Screening Level Oil Spill Modeling

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SCREENING LEVEL OIL SPILL MODELING

1.0 SPILL MODELING

1.1 PURPOSE

The approach used in this Supplemental EIS to identify impact to receptors is intended as a screening level approach and not intended to predict spill fate and transport for every condition along the pipeline route. The purpose of the screening is to identify reasonable distances release volumes would migrate over land or as dissolved-phase plumes in groundwater to facilitate identifying potential impact to receptors. Plumes were assessed for overland spreading and impact to groundwater and the resulting dispersion of the dissolved-phase constituent benzene. By identifying potential could-affect areas of the Project route, mitigation and response actions can be reassessed and addressed prior to pipeline operation.

1.2 METHODOLOGY

The approach attempts to be technically neutral but errs on the side of conservatism. As an example, overland spreading does not address volume losses due to evaporation and surface oiling of vegetation. Because of the technically neutral approach in this evaluation, it is assumed that management plans, emergency response plans (ERP), spill prevention, control, and countermeasure plans (SPCC), standard mitigation practice, and the Pipeline Hazardous Material Safety Administration (PHMSA) 57 special conditions will be implemented consistent with industry best practice.

Spill volumes used in this screening approach were based on data listed in Section 4.14.2.1, Background, of this Supplemental EIS. Overland spreading was evaluated by calculating the area of potential impact for each of the identified spill volumes (Grimaz et al. 2007). Areas were then used to assess the distance of radial spreading (representing smooth, flat ground). To further validate the spreading analysis, two separate peer-reviewed methodologies were implemented to calculate an equilibrium spill thickness for heavy, sour crude oil. A standard boundary layer condition formula using an interfacial tension based on heavy oil was used to identify a relative oil permeability value of 0.5 for use in the Grimaz equation for oil spreading. To assess the applicability of the approach, oil thickness was calculated from the oil spreading distance (Grimaz et al. 2007) and it was found to be consistent with the thickness of heavy oil calculated from the boundary layer calculation. Both the Grimaz equation and standard boundary layer condition formulas resulted in similar spill thickness values in the range of 0.2 cm (0.079 in) to 0.7 cm (0.28 in) based on the surface tension and kinematic viscosity. The objective of the spreading analysis approach is to facilitate screening in potential could-affect areas for the entire pipeline rather than establishing discrete site-specific scenarios that could unintentionally be screened out for further evaluation areas.

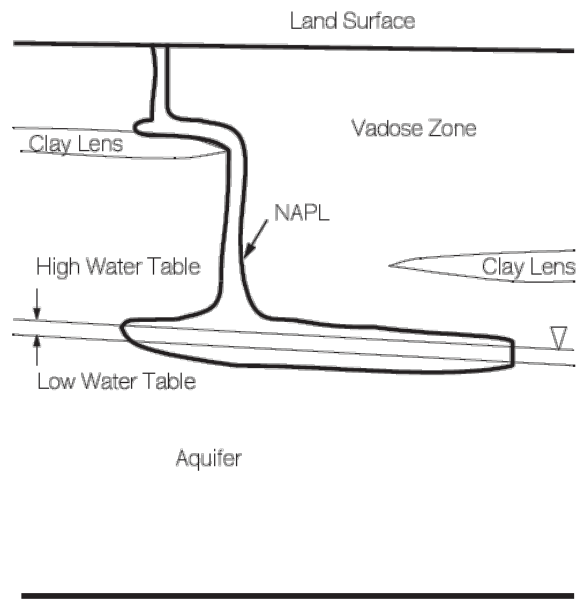
The model proposed by Grimaz et al. was developed as a simplified technique for predicting the maximum potential oil seepage depth into soil immediately after a release. As part of this model, Grimaz et al. proposed a simplified predictive formula derived from gravity current theory in

order to predict the extent of surface spreading after a release. The model as a whole is intended for use in estimating a window of opportunity for response action.

The U.S. Environmental Protection Agency (USEPA) Hydrocarbon Spill Screening Model (HSSM) was used to assess the potential impact to groundwater and, if a dissolved phase plume develops, determine the axial length of the plume. HSSM is intended as a practical tool to assess the effects of a surface or shallow subsurface release of liquid hydrocarbons from a spill, leaking tank, or pipeline with the advantage of simplicity and ease of computation (Charbeneau 1995). Simplified conceptualizations of the flow and transport phenomena were used so that the resulting model would be a practical, though approximate, tool. The model is intended for use in evaluating light non-aqueous phase liquid (LNAPL) transport and is not suitable for denser-than-water NAPLs (DNAPLs) as the model assumes NAPL to “float” on the water table. HSSM is not suitable for application to heterogeneous geological formations and is intended to provide order-of-magnitude estimates of contamination levels only. Additionally, the model is not designed to address dynamic conditions such as fluctuating groundwater, changing gradient, or specific design conditions such as pipeline trench systems or pressurized leaks from a pipeline. Emergency response, initial phases of site investigation, facilities siting, and underground storage tank programs are potential areas for use of HSSM (Weaver et al. 1994).

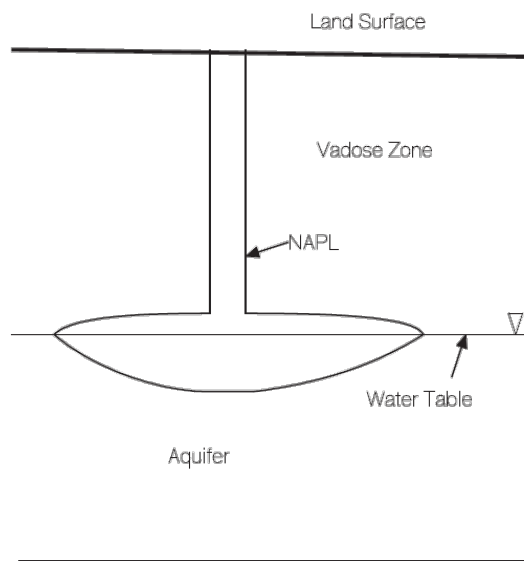
HSSM simulates the flow of LNAPL and the transport of a chemical constituent of the LNAPL from the surface to groundwater, radial spreading at the water table, and dispersion of a dissolved-phase constituent. A simplified conceptualization of the LNAPL release scenario is shown in Figure 1. The geometry assumed by HSSM is shown in Figure 2 and is based on the simplified conceptual LNAPL release scenario. At the water table, the LNAPL spreads radially, implying that the regional gradient has no effect on LNAPL flow. Dissolution of the chemical constituent obeys local equilibrium partitioning, but is driven by groundwater flow and recharge.

The model treats flow and transport as one-dimensional, which is a conservative approach as all the pollutant is assumed to move downward and contribute to aquifer contamination. Lateral contaminant spreading by capillary forces is neglected, except as these forces influence the infiltration of LNAPL into the soil. Also neglected is spreading due to heterogeneity since the subsurface is assumed to be of uniform composition. The presence of the water and air phases in the LNAPL is incorporated by use of a relative permeability model which uses measured soil properties (capillary pressure curve parameters) to approximate the relative permeability. The model does not include transport in fractures or macropores and assumes the LNAPL’s transport properties (i.e., density, viscosity, capillary pressure, relative permeability) to be unchanging.



Source: Weaver et al. 1994.

Figure 1 Schematic view of NAPL release



Source: Weaver et al. 1994.

Figure 2 Schematic view of idealized NAPL release that is used in HSSM

For the HSSM simulations, groundwater was assumed to be 0.3 m (1 ft) below the base of the spill to evaluate potential impact to a shallow aquifer. Hydrologic parameters used in the model for permeable sands were based on Carsel and Parrish (1988). Sandy soils are associated with high permeability vadose zone and aquifer materials. The horizontal hydraulic conductivity was

assumed to be 15 m/d (50 ft/day). Porosity was assumed to be 0.15 (Stanton 2010) and vertical hydraulic conductivity was assumed to be one order of magnitude smaller than horizontal hydraulic conductivity or 1.5 m/d (5 ft/d).

A viscosity of 325 cP at a specific gravity of 0.93 was reported for diluted bitumen (Leis et al. 2012). A density for heavy sour crude oil, 0.93 g/cm³, and a benzene concentration for light crude oil, 0.28% (exp Energy Services Inc. 2012), were used as conservative assumptions to evaluate the resulting dispersion of the dissolved-phase constituent. Other model parameters were within typical value ranges suggested for use in HSSM by Weaver et al. (1994). Table 1 summarizes the key input values used in the model simulation.

Table 1 Summary of Key Input Values Used in HSSM Simulation

Parameter	Input Value ^c	Source
Hydrologic Properties		
Depth to groundwater (m)	0.3	
Horizontal hydraulic conductivity (m/d)	15	Gutentag et al. 1984, Stanton 2010
Vertical hydraulic conductivity (m/d) ^a	1.5	
Porosity (vol%)	15	Stanton 2010
Hydrocarbon Phase Properties^b		
Viscosity- dilbit (cP) ^c	325	Leis et al. 2012
Density - heavy crude oil (g/cm ³)	0.93	exp 2012, Attanasi et al. 2007, Enbridge 2011
Benzene concentration – light crude oil (vol%) ^d	0.28	exp 2012, Section 3.13

^a Assumed 1/10th of horizontal hydraulic conductivity.

^b These hydrocarbon phase properties represent the range of possible products being transported through the pipeline.

^c Viscosity of dilbit was used to provide a larger plume size.

^d Light crude oil was used since it has a higher benzene content than heavy crude oil or dilbit.

^e % = percent; dilbit = diluted bitumen, cP = centipoise; ft/d = feet per day; g/cm³ = grams per cubic centimeter; m = meter or meters; m/d = meter per day

Additional simulations of HSSM for the 50 bbl and 20,000 bbl spills were run to delineate a lower and upper bound of the dissolved-phase plume length. Key input values modified included aquifer hydraulic conductivity and porosity, benzene concentration, and crude oil viscosity. For the lower bound simulation, aquifer vertical hydraulic conductivity was reduced to 0.7 m/day and porosity remained at 0.15. The benzene concentration reported for heavy crude oils, 0.16% (exp Energy Services Inc. 2012), and a crude oil viscosity of 157 cP (Enbridge 2011) were used to generate a smaller dissolve-phase plume size for the lower bound simulation. For the upper bound simulation, aquifer hydraulic conductivity was increased to 3.0 m/day and porosity was increased to 0.26 (Stanton 2010). Benzene concentration for light crude oil (0.28%) and a viscosity reported for dilbit (325 cP) were used in the upper bound simulation to generate a larger dissolved-phase plume size. All other model parameters not discussed above remained the same values as listed in Table 1 during these simulations.

1.3 RESULTS

The results of the HSSM simulations were used to identify reasonable benzene concentrations at the source from infiltrating LNAPL and distances the dissolved-phase plume could migrate until the benzene concentration attenuated to less than 0.005 mg/L, which is the maximum contaminant limit for Montana, South Dakota, and Nebraska. Using benzene to assess the

groundwater dispersion, model results show a spill would reach groundwater and migrate downgradient in each of the spill volume scenarios. Table 2 summarizes the axial length of surface and dissolved-phase plumes developed for each of the spill volumes assessed. A high level sensitivity analysis was also conducted using the same parameters above and identified that the three spill volumes could affect groundwater at a depth of 15 m (50 ft) or less. Additionally, the input parameters for the model were modified (e.g. aquifer hydraulic conductivity and porosity, benzene concentration, and crude oil viscosity) to simulate the largest dissolved plume length. The range of dissolved-phase spill plume lengths under these conditions was between 55 m (180 ft) and 490 m (1,608 ft).

Table 2 Axial Length of Plumes Based on Radial Spreading of Dissolved Constituent

	50 bbl	1,000 bbl	20,000 bbl
Surface plume axial length in meters (ft) ^a	34 (112)	112 (367)	370 (1,214)
Dissolved-phase plume axial length in meters (ft) ^b	195 (640)	250 (820)	320 (1,050)
Initial constituent concentration 1 meter from source (mg/L) ^b	8.3	8.8	9.0

^a Calculated from the formula proposed by Grimaz et al. (2007)

^b Output values from HSSM

2.0 DEFINITIONS

% = percent

bbl = barrel

cm = centimeter

cP = centipoise

ft = feet

ft/d = feet per day

g/cm³ = grams per cubic centimeter

in = inch or inches

m = meter or meters

m/d = meter per day

mg/L = milligrams per liter

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APPENDIX V

Past, Present, and Reasonably Foreseeable Future Project Descriptions

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PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE PROJECT DESCRIPTIONS

1.0 PAST PROJECTS

Past projects and activities considered in the cumulative effects assessment (CEA) are projects that have been completed and that have physical features established in the existing landscape.

1.1 CRUDE OIL PIPELINES AND STORAGE FACILITIES

1.1.1 Express-Platte Pipeline System

The Express-Platte Pipeline system is operated by Kinder-Morgan, Inc., and comprises two crude oil pipelines, the Express and the Platte (Kinder-Morgan 2012a). The Express pipeline originates in Hardisty, Alberta, Canada, and runs south through central Montana into central Wyoming, where it transitions to the Platte pipeline near Lost Cabin, Wyoming (Kinder-Morgan 2012a). The Express pipeline is within the project cumulative impact corridor (PCIC) from approximately Hardisty to Youngstown, Alberta. The Express pipeline is 24 inches in diameter, and is 785 miles long (Kinder-Morgan 2012a). The total capacity of the Express pipeline is approximately 280,000 barrels per day (bpd) and has been in operation since 1997 (Kinder-Morgan 2012a).

The Platte pipeline originates near Lost Cabin, Wyoming, and runs southeast through Wyoming before heading east-southeast across southern Nebraska, through the northeastern tip of Kansas, and across northern Missouri before terminating near Wood River, Illinois (Kinder-Morgan 2012a). The Platte pipeline crosses within the PCIC near Steele City in Jefferson County, Nebraska. The Platte pipeline is 20 inches in diameter and 932 miles long, with a total capacity of approximately 145,000 bpd and has been in operation since 1952 (Kinder-Morgan 2012a).

1.1.2 Keystone Mainline Pipeline

The Keystone Mainline pipeline is wholly owned and operated by TransCanada PipeLines Limited. The Keystone Mainline is a 2,154-mile long crude oil pipeline originating in Hardisty, Alberta, Canada, and terminating at Wood River and Patoka, Illinois (TransCanada 2012). The pipeline runs east-southeast through southern Alberta, Saskatchewan, and Manitoba (TransCanada 2012). In south-central Manitoba, the pipeline turns south crossing the U.S.-Canada border and running south through eastern North Dakota and South Dakota to Steele City, Nebraska, where one branch heads east through northern Missouri and terminates at Patoka, Illinois (TransCanada 2012).

The second branch from Steele City, Nebraska, is the Keystone Cushing Extension, further described in Section 1.1.3, Keystone Cushing Extension. The Keystone Mainline pipeline is within the PCIC of the proposed Project in southern Jefferson County, Nebraska. The Keystone Mainline began operating in 2010, with an approximate capacity of 435,000 bpd (TransCanada 2012).

1.1.3 Keystone Cushing Extension

The Keystone Cushing Extension is the southern branch of the Keystone Mainline pipeline, which originates in Steele City, Nebraska, and terminates in Cushing, Oklahoma (TransCanada 2012). The Cushing Extension is within the PCIC of the proposed Project in Steele City in Jefferson County, Nebraska. The Cushing Extension began operating in 2011, and has an approximate capacity of 590,000 bpd (TransCanada 2012).

1.1.4 True Company Pipelines

The True Company pipeline system is composed of Bridger Pipeline, LLC, the Belle Fourche Pipeline Co., and the Butte Pipeline Co., which own and operate the following pipelines in Montana, North Dakota, and Wyoming: Belle Fourche pipeline, Bridger Gathering System, Butte pipeline, Four Bears pipeline, and the Poplar System pipelines (Bridger Pipeline 2012). The Belle Fourche pipeline transports crude oil from the Williston Basin in western North Dakota to the Baker, Montana, receiving facility and is within the PCIC of the proposed Project near Baker, Montana (Belle Fourche Pipeline 2012). The Bridger Gathering System receives crude oil from the Belle Fourche, Four Bears, and Poplar systems and consists of a series of pipelines around Baker, Montana, where it is within the PCIC of the proposed Project.

The Butte pipeline runs north-south between Baker, Montana, and Ft. Laramie, Wyoming, and is within the PCIC of the proposed Project near Baker, Montana. The Four Bears pipeline is a new 12-inch-diameter crude oil pipeline that transports crude oil from McKenzie and Dunn Counties, North Dakota, to the Baker, Montana, receiving station, and is within the PCIC of the proposed Project near Baker, Montana. The Poplar pipeline consists of 10- and 12-inch-diameter pipelines that transport crude oil from the eastern Williston Basin to the Baker, Montana, receiving station, and is within the PCIC of the proposed Project near Baker, Montana (Bridger Pipeline 2012).

1.2 REFINED/FINISHED PRODUCT PIPELINES

1.2.1 Cenex Pipeline

The Cenex pipeline is owned and operated by Cenex Pipeline, LLC. The 8-inch-diameter refined products pipeline extends from the Williams Pipeline Terminal in Fargo, North Dakota, through north-central North Dakota and into northeastern Montana to the Cenex Refinery near Billings, Montana (Cenex Pipeline 2012). The Cenex pipeline is within the PCIC of the proposed Project in southeastern Dawson County, Montana.

1.2.2 Magellan Pipeline

The Magellan refined petroleum products pipeline is owned and operated by Magellan Midstream Partners, L.P. The Magellan petroleum products pipeline system runs generally north-south, with portions of the pipeline system located in the following states: North Dakota, Minnesota, Wisconsin, South Dakota, Iowa, Nebraska, Illinois, Missouri, Kansas, Colorado, Oklahoma, Arkansas, and Texas. Product terminals are located in each of the states listed except Wisconsin (Magellan Midstream Partners 2012). The Magellan petroleum products pipeline is within the PCIC of the proposed Project route in southern York County, Nebraska.

1.2.3 NuStar Pipelines: Refined Products and Ammonia

NuStar Energy, L.P. owns and operates crude oil, refined products, and ammonia pipeline systems throughout the central United States. The NuStar East Refined Products pipeline system runs north-south from Jamestown, North Dakota, through eastern South Dakota, western Iowa, eastern and southern Nebraska, and central Kansas. The East Refined Products pipeline is approximately 1,900 miles long, and portions of the pipeline are 16, 10, 8, or 6 inches in diameter. The East Refined Products pipeline carries gasoline, distillates, propane, natural gasoline, and naphtha (NuStar Energy 2012). The East Refined Products pipeline is within the PCIC of the proposed Project's route in southern York County, Nebraska.

One section of the NuStar Ammonia pipeline runs generally east-west from Nebraska through Iowa, Missouri, and Illinois before terminating near Huntington, Indiana; one branch of the Ammonia pipeline runs north-south from Missouri through Arkansas, and terminates in Taft, Louisiana (NuStar Energy 2012). The Ammonia pipeline is approximately 2,000 miles long, and sections are 10, 8, 6, or 4 inches in diameter. The Ammonia pipeline is within the proposed Project route in northwestern York County, Nebraska.

1.3 NATURAL GAS PIPELINES

1.3.1 WBI Energy Transmission

WBI Energy Transmission, formerly known as the Williston Basin Interstate Pipeline Company, owns and operates over 3,700 miles of natural gas transmission lines in North Dakota, South Dakota, Montana, and Wyoming. The pipeline system's annual transport volume is approximately 113.2 million decatherms (MMDK). WBI Energy Transmission also owns and operates the Baker Facility, an underground natural gas storage field near Baker, Montana (WBI Energy Transmission 2012). The WBI Energy Transmission pipeline system is within the PCIC of the proposed Project in northwestern Harding County, South Dakota, near Baker in Fallon County, Montana, and near Nashua, in Valley County, Montana. The Baker facility natural gas storage field is within the PCIC of the proposed Project near Baker in Fallon County, Montana.

1.3.2 Northern Border Pipeline

The Northern Border pipeline is owned by the Northern Border Pipeline Company, operated by TransCanada and Oneok Partners (Northern Border Pipeline Company 2012; TransCanada 2012). The Northern Border pipeline is 1,249 miles long, originating at the Port of Morgan, Montana, and running generally southeast through North Dakota, northeastern South Dakota, southwestern Minnesota, central Iowa, and northern Illinois before terminating near North Hayden, Indiana. The pipeline is 42 inches in diameter, and has a system receipt capacity of 2.37 billion cubic feet per day (bcf/d) (Northern Border Pipeline Company 2012). The Northern Border pipeline is within the PCIC of the proposed Project in northeastern Phillips County and northwestern Valley County, Montana.

Portions of the Northern Border pipeline would also be within the proposed Project cumulative impact corridor in northeastern Montana. The proposed Project right-of-way (ROW) would parallel the Northern Border pipeline for approximately 21.5 miles beginning at the U.S.-Canada border near Morgan, Montana. The Northern Border pipeline is an existing natural gas pipeline that has been in service since 1982. This pipeline's permanent ROW has been reclaimed, and

routine maintenance and refurbishment activities would continue along the ROW during construction and operation of the proposed Project.

1.3.3 Northern Natural Gas Company

The Northern Natural Gas Company owns and operates 14,900 miles of pipeline throughout Michigan, Wisconsin, Minnesota, South Dakota, Iowa, Illinois, Nebraska, Kansas, Oklahoma, New Mexico, and Texas. The system of pipelines has been in operation since 1930, and has a market area design capacity of 5.5 bcf/d, with pipe sizes ranging from 2 to 36 inches in diameter (Northern Natural Gas 2012). The Northern Natural Gas Company pipeline system is within the PCIC of the proposed Project route in southern Jefferson County, Nebraska, and southwestern Saline County, Nebraska.

1.3.4 Rockies Express West

The Rockies Express West natural gas pipeline is jointly owned and operated by Kinder-Morgan, Sempra Pipelines and Storage, and ConocoPhillips. The Rockies Express West pipeline is 1,679 miles long, and extends generally east-west from Cheyenne, Wyoming to central Missouri, where it continues as the Rockies Express East pipeline into Clarington, Ohio. The Rockies Express East pipeline went into operation in 2009, and the entire Rockies Express West and East system has a capacity of 1.8 bcf/d (Kinder-Morgan 2012b). The Rockies Express West pipeline is within the PCIC of the proposed Project near Steele City in Jefferson County, Nebraska.

1.3.5 Bison Natural Gas Pipeline

The Bison Natural Gas pipeline is owned by Bison Pipeline, LLC, which is owned by TransCanada and its subsidiaries. The Bison pipeline extends from southwestern North Dakota to northeastern Wyoming, is approximately 302 miles long, and is 30 inches in diameter. The pipeline has been in operation since 2011, and has an operating capacity of 407 MMcf/d, with potential expansion to 1 bcf/d (Bison Pipeline LLC 2012). The Bison pipeline is within the PCIC of the proposed Project in southeastern Fallon County, Montana.

1.3.6 Kinder-Morgan Interstate Gas Transmission (KMIGT)

The KMIGT system is owned and operated by Kinder-Morgan Interstate Gas Transmission LLC, and extends from central Wyoming through northeastern Colorado and northwestern Kansas, and covers most of Nebraska. The total system length is approximately 5,100 miles, with approximately 10 bcf of firm capacity commitments (Kinder-Morgan 2012c). The KMIGT system is within the PCIC of the proposed Project in Fillmore, York, Boone, Antelope, and Holt Counties in Nebraska. The KMIGT system is within the PCIC of the proposed Project route in York, Merrick, Nance, and Holt Counties, Nebraska.

1.3.7 Trailblazer Pipeline

The Trailblazer pipeline is owned and operated by the Trailblazer Pipeline Company LLC, a wholly owned Kinder-Morgan company (Kinder-Morgan 2012d). The Trailblazer pipeline extends approximately 175 miles from the Rockies Express West pipeline in Gosper County, Nebraska, to Beatrice, Nebraska (Kinder-Morgan 2012c). The Trailblazer pipeline is within the PCIC of the proposed Project in southern Saline County, Nebraska.

1.3.8 Natural Gas Pipeline Company of America: Amarillo Line

The Natural Gas Pipeline Company of America is owned and operated by NGPL PipeCo LLC, which is wholly owned by Kinder-Morgan, Inc. The natural gas pipeline system is over 10,000 total miles of pipeline, with a 265 bcf working gas storage capacity (Kinder-Morgan 2012e). The system consists of two primary pipeline routes. The first route runs from Chicago, Illinois, west to Nebraska, then southwest through central Kansas, northwestern Oklahoma and Texas, and southeastern New Mexico. The second route runs from Chicago, Illinois, south through southeastern Missouri, central Arkansas, and eastern Texas (Kinder-Morgan 2012c). The Natural Gas Pipeline Company of America system is within the PCIC of the proposed Project near Steele City in Jefferson County, Nebraska.

1.3.9 Central City Gas System

The Central City Gas System is owned and operated by Central City, Nebraska, and has been in operation since the 1940s. The system is composed of individual service lines between 0.75 and 1.75 inches in diameter, up to a 6-inch-diameter transmission line (Central City Utilities 2012). The Central City Gas System is within the PCIC of the proposed Project in southern Polk County, Nebraska and in northeastern Hamilton County, Nebraska.

1.3.10 SourceGas, LLC

The SourceGas natural gas pipeline system is owned and operated by SourceGas Distribution, LLC, and is located within portions of Colorado, Wyoming, and Nebraska. The SourceGas Nebraska pipeline serves the western two-thirds of Nebraska, and consists of approximately 5,000 miles of transmission and distribution pipelines (SourceGas 2007). The SourceGas pipeline system is within the PCIC of the proposed Project in Boone, Holt, and Greeley counties, Nebraska.

1.4 WATER DELIVERY SYSTEM:

1.4.1 Perkins County Rural Water System

The Perkins County Rural Water System is an extension of the Southwest pipeline from Lake Sakakawea in North Dakota. The rural water system, completed in 2007, serves approximately 2,500 residents of Perkins County (FedGazette 2005). Exact pipeline locations are not available; the proposed Project runs through southwestern Perkins County and the water system may be within the PCIC of the proposed Project.

1.4.2 Mni Wiconi Rural Water System

The Mni Wiconi Rural Water System project will deliver drinking water for residents of three tribal water systems and one non-tribal system in south-central South Dakota, managed by the U.S. Department of the Interior, Bureau of Reclamation (U.S. Department of the Interior 2012). The project is expected to be completed in 2013, and when complete, will be a network of 4,400 miles of 10- and 12-inch-diameter pipeline serving more than 51,000 people in 10 South Dakota counties (Natural Resources Defense Council 2012). Exact pipeline locations are not available, but the water system will be located in the following South Dakota counties, through which the proposed Project would pass: Haakon, Jones, Lyman, and Tripp.

1.5 ELECTRICAL TRANSMISSION LINES

The U.S. electric grid consists of higher voltage transmission lines ranging from 345 to 1,000 kilovolts (kV) located across the country (National Public Radio [NPR] 2009). Existing transmission lines of lower-range voltage of 345 to 499-kV are located in eastern and western Nebraska, and eastern and southwestern South Dakota. Specific locations of transmission lines, substations, and power generation facilities were not available. Transmission lines are likely to cross within the PCIC of the proposed Project route.

1.6 RAILROADS

1.6.1 Union Pacific Railroad

The Union Pacific Railroad operates on approximate 32,000 miles of track in 23 states (Union Pacific 2012). In Nebraska, the Union Pacific Railroad runs generally east-west across the southern half of the state in the west, and splits into a northern and southern line in Kearney County, Nebraska (Nebraska Department of Roads [NDOR] 2009). The northern line intersects the PCIC of the proposed Project route in Merrick County, Nebraska. The southern line intersects the proposed Project in Jefferson County, Nebraska.

1.6.2 BNSF Railway

The BNSF Railway operates on approximately 32,000 miles of track in 28 states and two Canadian provinces (BNSF Railway Company 2012). In Nebraska, the BSNF rail lines cross generally east-west across the central and southern portions of the state, with north-south routes along the eastern and western borders of the state (NDOR 2009). In South Dakota, BNSF operates rail lines primarily in the eastern portion of the state, and across the northern border (South Dakota Department of Transportation [SD DOT] 2009). BSNF operates rail lines throughout Montana, including the eastern and northern portions of the state (Montana State Library 2012). BNSF rail lines are within the PCIC of the proposed Project route in Fillmore and York counties, Nebraska, and Fallon, Dawson, and Valley counties, Montana.

1.6.3 Nebraska Central Railroad Company

The Nebraska Central Railroad Company consists of 340 miles of track in eastern Nebraska (RioGrand Pacific 2011). The Nebraska Central Railroad Company lines cross within the PCIC of the proposed Project in Polk, Nance, and Boone Counties, Nebraska.

1.6.4 Nebraska Northeastern Railway

The Nebraska Northeastern Railway operates on approximately 120 miles of track in northeastern Nebraska, running generally east-west from the Missouri River to O'Neill, Nebraska (NDOR 2009). The Nebraska Northeastern Railway lines cross the PCIC of the proposed Project in Antelope and Holt Counties, Nebraska.

1.6.5 CP/Dakota, Minnesota & Eastern

The CP/Dakota, Minnesota & Eastern railroad operates on 574 miles of track running generally east-west through central South Dakota, and generally north-south through western South Dakota

(SD DOT 2009). The CP/Dakota, Minnesota & Eastern lines cross the PCIC of the proposed Project in Haakon County, South Dakota.

1.6.6 South Dakota Owned/Dakota Southern Operated

The South Dakota Owned/Dakota Southern Operated Railroad operates on 190 miles of track that runs generally east-west across southern South Dakota along the route of Interstate 90 (SD DOT 2009). The South Dakota Owned/Dakota Southern Operated Railroad is within the PCIC of the proposed Project in Jones County, South Dakota.

1.7 WIND FARMS

1.7.1 Diamond Willow Wind Farm

The Diamond Willow Wind Farm is owned and operated by Montana-Dakota Utilities and is located near Baker in Fallon County, Montana. The first phase of development was completed in 2008 with an expansion in 2010 for a total of 20 General Electric 1.5-megawatt (MW) turbines (Montana Department of Environmental Quality 2012). The exact acreage and extent of the wind farm is not available, but portions of the farm are likely within the PCIC of the proposed Project near Baker, Montana.

1.7.2 Laredo Ridge Wind Farm

The Laredo Ridge Wind Farm is located on approximately 7,600 acres of land, 3 miles northeast of Petersburg in Boone County, Nebraska. The site operates 54 1.5-MW turbines, with an approximate total power supply of 80-MW (Midwest Wind Energy 2008). The Laredo Ridge Wind Farm is within the PCIC of the proposed Project in Boone County, Nebraska.

1.8 LANDFILLS

Three landfills were identified within the PCIC of the proposed Project route. Two of the landfills are closed; one is located near Baker, Montana, and one is near Nashua, Montana (Montana State Library 2012). One active landfill near O'Neill, Nebraska, accepts construction and demolition debris (Nebraska Department of Environmental Quality 2011).

1.9 POWER PLANTS

One power generation facility was identified in York, Nebraska, as the Mobile Petroleum Plant, operated by the Nebraska Public Power District. The facility provides 3.1-MW of electricity generated from petroleum (Nebraska Public Power District 2012). The facility is within the PCIC of the proposed Project in York County, Nebraska.

1.10 GRAZING LANDS

Land use data indicate that the majority of undeveloped land in Nebraska, South Dakota, and Montana is used for grazing herd animals. Grazing lands are likely to be within the PCIC of the proposed Project in undeveloped portions of the counties through which the proposed pipeline would run.

1.11 OIL AND GAS WELL FIELDS

High-producing oil and gas well fields are located in northwestern South Dakota and northeastern Montana as part of the Williston Basin (U.S. Energy Information Administration [EIA] 2012). Oil and gas wells not located within a high-producing well field are considered “wildcat” wells and may be located through any portion of South Dakota and Montana. One primary field, Buffalo, is located in Harding County, South Dakota, and contains many wells within the PCIC of the proposed Project (SDDENR 2012b). Well fields within the PCIC in Montana include the Gas Light, Plevna, Plevna South, and Cedar Creek in Fallon County; and the Weldon field in McCone County (EIA 2012). Additionally, a natural gas storage facility is located in Baker, Fallon County, Montana.

1.12 MINE AND MINERAL EXTRACTION SITES

Thirty mine and mineral extraction sites were identified within the PCIC of the proposed Project route in Fallon, Dawson, McCone, and Valley counties, Montana. Of those, 4 were active gravel pits, 1 was an active surface coal field, 19 were abandoned coal fields, 1 was an active bentonite surface mine, and 5 were abandoned surface mines without additional details on the previously mined mineral type (Montana State Library 2012).

Twenty-two mine and mineral extraction sites were identified within the PCIC of the proposed Project route in Tripp, Jones, Haakon, Meade, and Harding counties, South Dakota. Of those, 11 were active sand and gravel pits and 11 were inactive sand and gravel pits.

Twenty-two mine and mineral extraction sites were identified within the PCIC of the proposed Project route in Keya Paha, Boyd, Holt, Antelope, York, Fillmore, and Jefferson counties, Nebraska. Of those, 5 were active sand and gravel pits, 13 were abandoned sand and gravel pits, and 4 were inactive sand and gravel pits.

1.13 FEEDLOTS

A feedlot is a type of animal feeding operation which is used in factory farming. Very large feedlots are classified as *concentrated animal feeding operations*, or CAFOS, and are used to increase the size of livestock before slaughter. The National Agricultural Statistic Service has compiled a map of the largest agricultural operations (more than 10,000 cattle and calves) for the state of Nebraska (National Agricultural Statistics Service 2012; U.S. Environmental Protection Agency [USEPA] 2012).

1.14 GRAIN AND AGRONOMY HUB: CENTRAL VALLEY AGRICULTURE, CLARKS LOCATION

The Central Valley Agriculture (CVA) Clarks location is an agronomy hub that offers fertilizers, chemicals, insecticides, seed and seed treatments, custom application, and precision technology and scouting services to the agricultural sector in Central Nebraska (CVA 2011; CVA 2012). The CVA Clarks location is within the PCIC of the proposed Project route in northeastern Merrick County, Nebraska.

2.0 PRESENT PROJECTS

Present projects and activities considered in the CEA are those that have been approved and are under construction.

2.1 CRUDE OIL PIPELINES AND STORAGE FACILITIES

Construction on the TransCanada Gulf Coast pipeline began in August 2012, and is anticipated to be complete and operational by mid- to late 2013 (TransCanada 2012). The Gulf Coast project will construct 484 miles of new pipeline through Oklahoma and Texas, and will transport crude oil from Cushing, Oklahoma, south to Nederland, Texas (TransCanada 2012). Approximately 393 miles (82 percent) of the total 484 miles would be within approximately 300 feet of existing pipelines, utilities, or road ROWs. The remaining 87 miles (18 percent) would be in new ROWs. Keystone proposes to construct a tank farm on an approximately 74-acre site that is about 2,000 feet from the southern end of the existing Cushing Oil Terminal. The Gulf Coast project would affect approximately 8,542 acres during construction. After project completion, the temporary 110-foot-wide ROW that is necessary during construction activities will be necked down to 50 feet of permanent ROW, which would be maintained for the life of the project. Total acreage that would be permanently affected is 3,121 acres. Additionally, the pipeline would require the construction of several ancillary facilities such as pump stations, tank farms, intermediate mainline valves (MLVs), and access roads.

2.2 WATER DELIVERY SYSTEMS: DRY PRAIRIE RURAL WATER SYSTEM

The Dry Prairie Rural Water System is currently under construction in northeastern Montana, and will include water pipelines in Valley, Daniels, Sheridan, and Roosevelt counties (Dry Prairie Rural Water Authority 2006). To date, approximately 30 percent of the system has been completed. The water system will cross the PCIC of the proposed Project in Valley County, Montana, near the town of Nashua, where a 14-inch-diameter section of pipeline will run east-west across southern Valley County, and south of St. Marie, Montana, where a 6-inch-diameter section of pipeline will run north-south through central Valley County.

2.3 NATURAL GAS PIPELINES: BAKKEN NGL PIPELINE

The Bakken Natural Gas Liquids (NGL) pipeline is currently under construction by Oneok Partners. The pipeline will be approximately 500 miles long, from northeastern Montana south to northern Colorado, where it will intersect with Oneok's Overland Pass pipeline. Construction is expected to be complete by 2013, with the pipeline in service in the first half of 2013 (Oneok Partners 2012a).

2.4 HIGHWAY CONSTRUCTION

Current highway construction projects in Nebraska include repairs to Interstate 80 within the PCIC of the proposed Project route in Hamilton County (NDOR 2012).

Current highway construction projects in South Dakota include repairs to US-85 and South Dakota Route 79 in Harding County, potentially within the PCIC of the proposed Project near

Buffalo and Reva, South Dakota (SD DOT 2012). Additional construction along I-90 may be within the PCIC of the proposed Project near Murdo in Jones County (SD DOT 2012).

No current highway construction in Montana is within the proposed Project PCIC (Montana Department of Transportation 2012).

2.5 CENTRAL VALLEY AGRICULTURE: ROYAL LOCATION

The CVA Royal location will be an agronomy and grain hub that will offer and ship grain, fertilizers, chemicals, insecticides, seed and seed treatments, custom application, and precision technology and scouting services to the agricultural sector in central Nebraska. CVA estimates that three million bushels of grain storage will be constructed. The site will have a 30,000 bushel per hour unloading capacity and a 60,000 bushel per hour loading capacity. This CVA Royal location includes a 120-car shuttle train load-out platform and an oval track that will surround the site. The facility will be constructed along the Nebraska Northeastern Railway, which connects to the BNSF railway (CVA 2011, CVA 2012). The CVA Royal facility is within the PCIC of the proposed Project route in northwestern Antelope County, Nebraska.

3.0 REASONABLY FORESEEABLE FUTURE PROJECTS

3.1 CRUDE OIL PIPELINES AND STORAGE FACILITIES

3.1.1 Bakken Marketlink Project

The Bakken Marketlink Project is a project proposed by TransCanada to provide crude oil transportation service from near Baker, Montana, to Cushing, Oklahoma. This project includes a crude oil pipeline and tankage facilities near Baker, Montana, as well as connecting pipelines, manifolds, metering stations, and associated facilities. The project is proposed to transport up to 100,000 bpd of crude oil, and is expected to be in service in the first or second quarter of 2015. The Bakken Marketlink Project would compete in the market with other transport options to move Williston Basin crude to refiners in other areas of the country.

3.1.2 Bakken Crude Express Pipeline

The Bakken Crude Express pipeline is a project proposed by Oneok Partners to construct a 1,300-mile-long pipeline to transport crude oil from the Bakken Shale in the Williston Basin in North Dakota to Cushing, Oklahoma (Oneok Partners 2012b; Walton 2012). The proposed Bakken Crude Express pipeline route would cross within the PCIC of the proposed Project route in eastern Montana.

3.2 ELECTRICAL DISTRIBUTION LINES AND SUBSTATIONS

3.2.1 Big Bend to Witten 230-kV Transmission Line

The Basin Electric Power Cooperative proposed the construction of an approximately 70-mile, high-voltage transmission line from a new substation near the Big Bend Dam to an existing substation in Witten, South Dakota (BEPC 2012b). The project is anticipated to be in service by the end of 2013, with construction planned for spring 2013. The proposed transmission lines

would potentially cross within the PCIC of the proposed Project route in Lyman and Tripp counties, South Dakota.

3.2.2 Chinook Project

TransCanada proposed the construction of a high-voltage direct current (HVDC) transmission line originating in Montana, traveling through Idaho, and delivering electricity to Las Vegas, Nevada, with future extensions to Los Angeles, California, and Phoenix, Arizona. The proposed line would be rated at approximately 3,000-MW, and sourced from coal and wind generation resources in Montana (Montana Department of Commerce 2012). A 2010 article in the Billings Gazette indicated that the project was put on hold by the developers, TransCanada. The proposed transmission lines would potentially be within the PCIC of the proposed Project in eastern Montana.

3.2.3 New 765-kV Electric Transmission Lines

A proposed expansion of the U.S. electric grid would involve the construction of new 765-kV electric transmission lines across the country (NPR 2009). These transmission lines would potentially be within the PCIC of the proposed Project route in eastern Nebraska, southern and eastern South Dakota, and in southeastern Montana.

3.3 WATER DELIVERY SYSTEMS

The Dry-Redwater Water Authority rural water system is a proposed rural water transport system through Richland, Dawson, McCone, Prairie, and Garfield counties, Montana (Dry-Redwater Regional Water Authority 2011). The proposed water system would potentially be within the PCIC of the proposed Project in McCone and Dawson counties, Montana.

3.4 PROPOSED WIND FARMS

One unnamed wind farm project is proposed to be constructed on state-owned land in Valley County, Montana, and is anticipated to have a 100 to 299 MW capacity, with construction beginning in 2 to 3 years (The Policy Institute 2010). The project would potentially be within the PCIC of the proposed Project in Valley County, Montana.

Four proposed wind farms were identified in South Dakota as potentially being within the PCIC of the proposed Project route. Two proposed farms, New Underwood North and New Underwood South, would be located in southeastern Haakon County, with an anticipated 50- to 125-MW capacity. Two proposed farms, Basin Electric SD-2 and Basin Electric SD-3, would be located in Tripp and Jones counties, respectively, both with an anticipated 50- to 125-MW capacity (South Dakota Energy Development 2011).

One wind farm, Grand Prairie, is proposed to be located in Holt County, Nebraska, approximately 12 miles northeast of O'Neill. The project is currently undergoing NEPA review. The project is anticipated to have a 400-MW capacity, and would be tied into the existing Western Area Power 345-kV Fort Thompson to Grand Island transmission line (Western Area Power Administration 2012). Based on information provided by the Western Area Power Administration, the project location would be within the PCIC of the proposed Project through Holt County, Nebraska.

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APPENDIX W

Life-Cycle Greenhouse Gas Emissions of Petroleum Products from WCSB Oil Sands Crudes Compared with Reference Crudes

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ACRONYMS

API	American Petroleum Institute
bbl	barrel
CCS	carbon capture and storage
CO ₂	carbon dioxide
CSS	cyclic steam stimulation
EIA	U.S. Energy Information Administration
EIS	Environmental Impact Statement
FCC	fluid catalytic cracker
gCO ₂ /MJ	grams carbon dioxide per megajoule
gCO ₂ e/MJ	grams carbon dioxide equivalent per megajoule

GHG	greenhouse gas
GOR	gas-oil ratio
H ₂	hydrogen
HHV	higher heating value
ISO	International Organization for Standardization
kg CO ₂ e	kilograms carbon dioxide equivalent
LCA	life-cycle assessment
LCFS	California's Low Carbon Fuel Standard
LHV	lower heating value
LPG	liquefied petroleum gas
m	meter
MJ	megajoule
MMTCO ₂ e	million metric tons of carbon dioxide equivalent
NA	not applicable
NETL	National Energy Technology Laboratory
NG	natural gas
OECD	Organization for Economic Cooperation and Development
PADD	Petroleum Administration for Defense Districts
RBOB	reformulated blendstock for oxygenate blending
RFS2	USEPA Renewable Fuel Standard
SAGD	steam-assisted gravity drainage
SCO	synthetic crude oil
SOR	steam-oil ratio
TTW	tank-to-wheels
WCSB	Western Canadian Sedimentary Basin
WTR	well-to-refinery gate
WTT	well-to-tank
WTW	well-to-wheels

1.0 OBJECTIVE

This appendix accompanies the text in Section 4.15, Cumulative Effects Assessment, of the Supplemental EIS, and examines differences between the life-cycle greenhouse gas (GHG) emissions associated with Western Canadian Sedimentary Basin (WCSB) oil sands-derived crudes compared with reference crudes refined in the United States. The ultimate goal of this effort is to provide context for understanding the potential indirect, cumulative GHG impact of the proposed Keystone XL pipeline (the proposed Project). Rather than conducting new modeling or analysis, this study reviews existing life-cycle studies (including several meta-analyses) and models that estimated the GHG implications for WCSB oil sands-derived and reference crudes to (a) identify and evaluate key factors driving the differences and range, and (b) explain the range of life-cycle GHG emission values.

This appendix offers a conceptual framework for understanding the carbon and energy flows within a petroleum system in Section 2.0, Conceptual Framework. Section 3.0, Approach, describes the approach taken, including the scope of the review of the life-cycle studies. Section 4.0, Results and Discussion, then discusses the key factors driving the comparisons between WCSB crudes and reference crudes and examines the differences between the study results across various scenarios. Section 5.0, Petroleum Coke Characteristics, GHG Emissions, and Market Effects, discusses the physical characteristics of petroleum coke, examines studies estimating GHG emissions from coke combustion, and discusses the WCSB oil sands effects on the petroleum coke market. Section 6.0, Incremental GHG Emissions of Displacing Reference Crudes with WCSB Oil Sands, concludes by synthesizing key findings and providing a brief discussion on future trends.

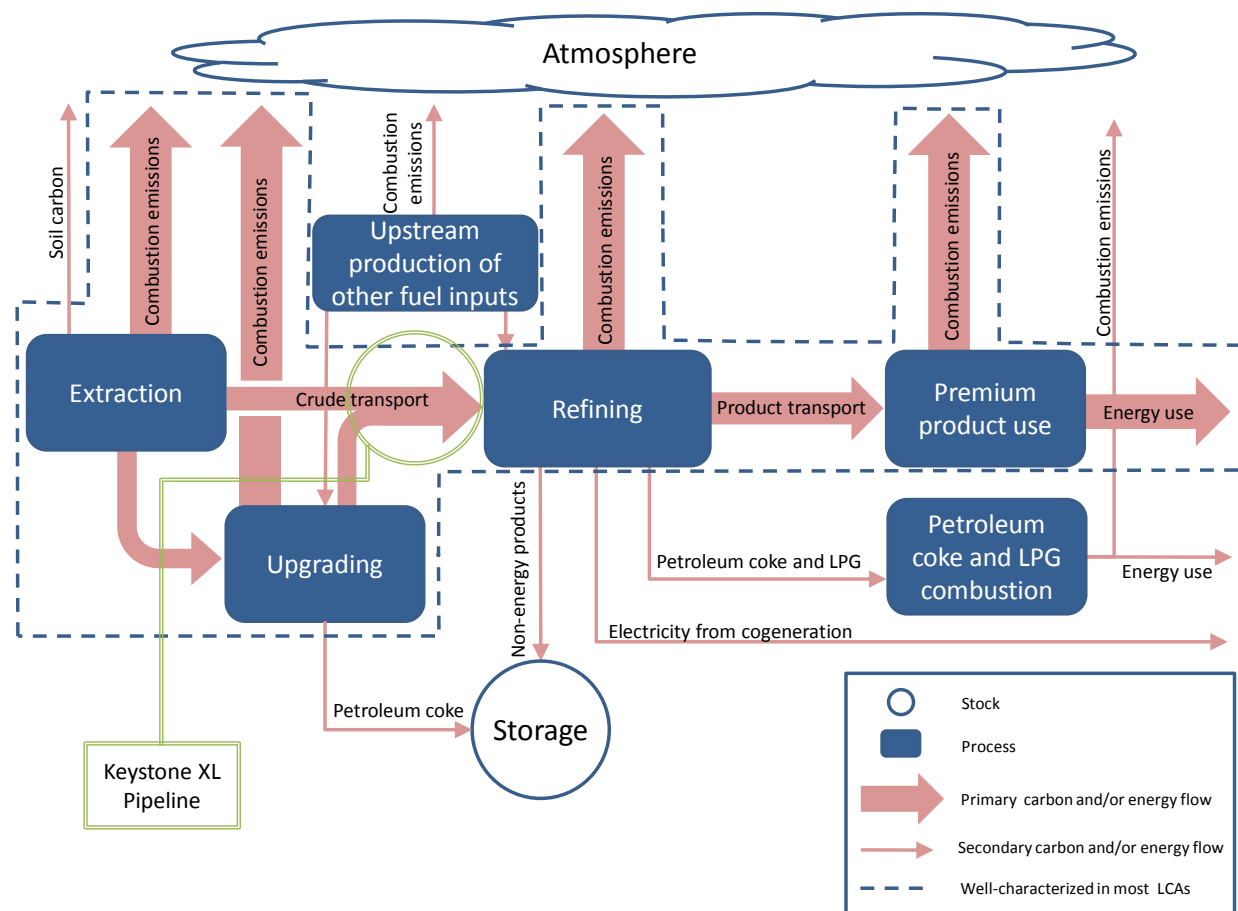
2.0 CONCEPTUAL FRAMEWORK

A comparative life-cycle assessment (LCA) of fuels is driven by two accounting approaches: a carbon mass balance and an energy balance. Within each balance, it is helpful to distinguish between what can be considered primary flows and secondary flows. The primary carbon and energy flows are those associated with the production of three premium fuel products—gasoline, diesel, and kerosene/jet fuel—by refining crude oil. In addition to the premium fuels, other secondary co-products such as petroleum coke, liquefied petroleum gas (LPG), and sulfur are produced as well. Primary flows are generally well-understood and included in LCAs.

In addition to primary flows, there are a range of secondary energy flows and emissions to consider. Because these flows are outside the primary operations associated with fuel production, they are often characterized differently across studies or excluded from LCAs, and estimates of specific process inputs and emission factors vary according to the underlying methods and data sources used in the assessment.

See Figure 2-1 for a simplified petroleum system flow diagram. This framework is helpful for describing differences across life-cycle comparisons of fuel GHG emissions. Classifying the flows as primary and secondary according to the objective of producing premium fuel products from crude helps to understand why certain flows and sources of emissions may be excluded due to a lack of data or methods to estimate secondary flows, where processes are defined relatively

consistently, and where different methods are used for treating LCA issues, such as co-products. This helps formulate conclusions about the key drivers that influence fuel life-cycle comparisons.



Source: ICF, Final EIS 2011

Figure 2-1 Simplified petroleum system carbon and energy flow

2.1 CARBON MASS BALANCE

In the case of the carbon mass balance, it is helpful to consider the differences between the primary carbon flows and the secondary carbon flows. Primary carbon flows characterize most of the carbon in the system and start as crude in the ground. The crude is processed into premium fuel products such as gasoline, diesel, and kerosene/jet fuel, which are combusted and converted to CO₂. These carbon flows drive the economics and engineering of the oil business and they are well-understood and well-characterized. Secondary carbon flows exist outside the primary crude–premium-fuel-products–combustion flow. Examples of secondary carbon flows associated with petroleum products include the production and use of petroleum coke; non-energy uses of petroleum, such as lubricating oils, petrochemicals, and asphalt; and changes in biological or soil

carbon stocks as a result of land-use change. Among LCA studies, the life-cycle boundaries vary considerably in terms of whether and how they cover secondary carbon flows. Because much of this secondary carbon is peripheral to the transportation fuels business (e.g., petroleum coke is often regarded as an unwanted co-product), studies use different approaches for evaluating these flows, and in some cases, the available information may be less complete compared to the primary crude–premium-fuel-products–combustion part of the system. Note that lube oils and petrochemical feedstocks are considered peripheral to the primary fuel products that are combusted for energy.

2.2 ENERGY BALANCE

The energy balance consists of primary flows of premium fuel product-related energy and secondary flows of imported and exported energy. Most of the energy in the system is involved in extracting, upgrading, refining, transporting, and combusting the crude and premium fuel products, and most of the energy consumed comes from the crude. The vast majority of the energy exits the system when the premium fuel products are combusted. Similar to primary carbon flows, primary energy flows are well-understood and well-characterized. The secondary, imported energy comes from sources other than crude such as purchased electricity or natural gas and includes energy required to build capital equipment and infrastructure. The secondary, exported energy comes from crude but is not retained in the premium fuel product. For example, co-generation used for in situ crude extraction methods generates electricity, which is exported to the grid, or petroleum coke can be burned in lieu of coal to generate steam and/or electricity. The GHG emissions associated with imported and exported energy are highly sensitive to assumptions about the fuels involved.

3.0 APPROACH

The general approach for this study included the following steps, which are described in more detail below:

1. Establish the review scope;
2. Identify the studies for review;
3. Develop a set of critical elements to review in each study;
4. Review the studies and refine the critical elements;
5. Evaluate the elements across studies to identify the key drivers of the differences in GHG intensity; and
6. Summarize the key drivers and place the GHG emission results in context.

3.1 ESTABLISH THE SCOPE FOR THE REVIEW

The scope of the boundaries considered for this analysis include well-to-wheels (WTW) emissions resulting from extraction and processing of the crude from the reservoir, refining of the crude, combustion of the refined products, and transportation between the life stages. This study also examines results for individual stages and portions of the life-cycle for oil sands-

derived crudes and reference crudes where values were reported. Not all studies in this review include a full WTW life-cycle assessment; several studies focus on the well-to-tank (WTT) portion of the life-cycle, while others consider only the crude production emissions. WTT analyses include the emissions associated with the processes up to, but not including, combustion of the refined products. This study looks at the GHG implications for the three premium fuel products (i.e., gasoline, diesel, and jet fuel) as well as co-products derived from the different types and sources of crude oil.

In order to understand the differences not only between WCSB oil sands-derived crudes and reference crudes, but also between different types of WCSB oil sands crudes and technologies, this study included the following types of crudes derived from WCSB oil sands:¹

- Canada oil sands cyclic steam stimulation (CSS) bitumen, synthetic crude oil (SCO),² dilbit,³ and synbit⁴
- Canada oil sands steam-assisted gravity drainage (SAGD) SCO, bitumen, dilbit, and synbit
- Canada oil sands mining SCO, bitumen, dilbit, and synbit

Section 4.2.1.1, Type of Extraction Process, describes the different extraction methods in detail.

Four reference crudes were selected to reflect a range of crude oil sources and GHG intensities:

- The average U.S. barrel consumed in 2005 (National Energy Technology Laboratory [NETL] 2008). This reference was selected because it provides a baseline for fuels produced from the average crude consumed in the United States. It also serves as the baseline in the U.S. Renewable Fuel Standard Program, RFS2 (U.S. Environmental Protection Agency [USEPA] 2010a).
- Venezuela Bachaquero and Mexico Maya, which are representative of heavy crudes currently refined in PADD III refineries.⁵ Conceptually, these crudes may be displaced by the arrival of WCSB oil sands at the Gulf Coast refineries, although it is likely that they would find markets elsewhere and would still be produced.
- Saudi Light (i.e., Middle Eastern Sour), which was taken to be the balancing grade for world crude oil supplies in the Keystone XL Assessment. Conceptually, this crude is most likely to be backed out of the world market if additional supplies of WCSB oil-sands crudes are produced.

¹ In situ crude extraction methods of steam-assisted gravity drainage (SAGD) and cyclic steam stimulation (CSS) are more energy intensive than mining and involve drilling and injecting steam into the wellbore to recover deeper deposits of oil sands than those present on the surface (IHS CERA 2010).

² SCO is a product of upgrading bitumen.

³ Dilbit is diluted bitumen, a mix of bitumen and condensate. Diluting the bitumen reduces the viscosity so that it can flow through a pipeline.

⁴ Synbit refers to an SCO and bitumen blend.

⁵ Petroleum Administration for Defense Districts (PADDs) are geographic areas of the United States that were delineated in World War II to coordinate the allocation of fuels. PADD III refineries are those located in the Gulf Coast area, namely Alabama, Arkansas, Louisiana, Mississippi, New Mexico, and Texas (EIA 2011).

3.2 IDENTIFY THE STUDIES FOR REVIEW

Several studies provide assessments of the life-cycle GHG implications of WCSB oil sands crude relative to reference crudes. The Department, in conjunction with USEPA, USDOE, and CEQ, selected studies for review on the following basis:

- The reports evaluate WCSB crude oils in comparison to crude oils from other sources.
- The reports focus on GHG impacts throughout the crude oil life-cycle.
- The reports were published within the last 10 years (with one exception), and most were published within the last five years.
- The reports represent the perspectives of various stakeholders, including industry, governmental organizations, and non-governmental organizations.

Table 3-1 provides a list of primary and additional sources identified and reviewed for this analysis, which include eight LCAs, two partial LCAs, six meta-analyses (synthesizing results from other LCAs), two models, one white paper, and two journal articles on land use change.

Table 3-1 Primary and Additional Studies Evaluated

Primary Studies Analyzed	Type	Boundaries
NETL. 2008. Development of Baseline Data and Analysis of Life Cycle Greenhouse Gas Emissions of Petroleum-Based Fuels.	Individual LCA	WTW
NETL. 2009. An Evaluation of the Extraction, Transport and Refining of Imported Crude Oils and the Impact of Life Cycle Greenhouse Gas Emissions.	Individual LCA	WTW
IEA. 2010. World Energy Outlook.	Meta-analysis	WTW
IHS CERA. 2010. Oil Sands, Greenhouse Gases, and U.S. Oil Supply: Getting the Numbers Right.	Meta-analysis	WTW
IHS CERA. 2011. Oil Sands, Greenhouse Gases, and European Oil Supply: Getting the Numbers Right.	Meta-analysis	WTW
NRDC. 2010. GHG Emission Factors for High Carbon Intensity Crude Oils, ver. 2.	Meta-analysis	WTW
Energy-Redefined LLC for ICCT. 2010. Carbon Intensity of Crude Oil in Europe Crude.	Individual LCA	WTT ⁶
Jacobs Consultancy. 2009. Life Cycle Assessment Comparison of North American and Imported Crudes.	Individual LCA	WTW
Jacobs Consultancy. 2012. EU Pathway Study: Life Cycle Assessment of Crude Oils in a European Context.	Individual LCA	WTW
TIAX LLC. 2009. Comparison of North American and Imported Crude Oil Lifecycle GHG Emissions.	Individual LCA	WTW
Charpentier et al. 2009. Understanding the Canadian Oil Sands Industry's Greenhouse Gas Emissions.	Meta-analysis	WTW
Brandt, A. 2011. Upstream greenhouse gas (GHG) emissions from Canadian oil sands as a feedstock for European refineries.	Meta-analysis	WTW
Additional Studies/Models Analyzed		
RAND Corporation. 2008. Unconventional Fossil-Based Fuels: Economic and Environmental Trade-Offs.	Individual LCA	WTW
Pembina. 2005. Oil Sands Fever: The Environmental Implications of Canada's	Partial LCA	WTR ⁷

⁶ Excluding distribution.

Primary Studies Analyzed	Type	Boundaries
Oil Sands Rush.		
Pembina. 2006. Carbon Neutral 2020: A Leadership Opportunity in Canada's Oil Sands. Oil sands issue paper 2.	Partial LCA	WTR ⁷
McCann and Associates. 2001. Typical Heavy Crude and Bitumen Derivative Greenhouse Gas Life Cycles.	Individual LCA	WTW
GHGenius. 2010. GHGenius Model, Version 3.19. Natural Resources Canada.	Model	WTW
REET. 2010. Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation Model, Version 1.8d.1. Argonne National Laboratory.	Model	WTW
Pembina. 2011. Life cycle assessments of oil sands greenhouse gas emissions: A checklist for robust analysis.	White Paper	NA
Rooney et al. 2012. Oil Sands Mining and Reclamation Cause Massive Loss of Peatland and Stored Carbon.	Land use change journal article	NA
Yeh et al. 2010. Land Use Greenhouse Gas Emissions from Conventional Oil Production and Oil Sands.	Land use change journal article	NA

NA = not applicable, GHG = greenhouse gas, LCA = life-cycle assessment, WTR = well-to-refinery gate, WTW = well-to-wheels.

The list of primary and additional studies reflects recent updates to previous life cycle assessments of oil-sands-derived crudes and information on GHG emissions associated with land use change. Jacobs (2012) developed carbon intensities for Alberta crudes based on first order engineering principles and models and calculation methods used in the REET model (Jacobs Consultancy [Jacobs] 2012, Argonne National Laboratory 2010). Jacobs also correlated the results with data reported to and audited by the Canadian government. Regulatory authorities in Alberta require extensive bitumen production information ranging from fugitive and flaring data to the energy consumption and GHG emissions from bitumen production both from in-situ mining and from mining upgrading. Jacob's GHG emissions for producing the heavy Alberta crude oils by SAGD are based on engineering estimates using energy consumption that has a close correlation with data reported to the Alberta government (Jacobs 2012, p. 5-41). Jacobs' evaluation of the carbon intensity of mining and upgrading is based on data from audited industry and government reports, and engineering estimates based on estimated parameters governing crude oil production. Engineering models to estimate energy consumption and GHG emissions from bitumen production correlated well with energy use and GHG emissions reported to the Government of Alberta. The IHS CERA study (2011) does not contain any changes in emission estimates from IHS CERA (2010) except for the combustion emissions from the end use of refined products (IHS Cambridge Energy Research Associates [IHS CERA] 2011, 2010).⁸

The Jacobs 2012 report offers new analysis based on first order engineering principles and models. A quantitative analysis of the Jacobs report and its data has not been undertaken.

⁷ Up to oil sands facility gate, excluding transportation to refinery and refining.

⁸ IHS CERA (2010) provides a value of 384 kg CO₂e per barrel of refined product; IHS CERA (2011) study provides a value of 402 kg CO₂e per barrel of refined product. It is not clear from the 2010 report what refined product blend was used to estimate the combustion emissions value. However, it is clear that the refined product blend used in the 2011 study is different from the one used in the 2010 study. Combustion emissions from end use of refined products are assumed to be the same across all crudes examined in each study.

3.3 DEVELOP A SET OF CRITICAL ELEMENTS TO REVIEW IN EACH STUDY

An initial set of approximately 50 attributes were developed for review, guided by specifications on scope, data quality requirements, and appropriateness of comparisons from the ISO standards (14040:2006, 14044:2006) as well as an engineering understanding of crude oil life-cycle processes. These attributes are listed in Table 3-2. For each study and crude and fuel type specified, these elements included specifics on each stage of the life-cycle (e.g., whether the element was included in the study, and if so, the value, units, and data sources), boundary elements included/excluded, technology assumptions, equivalencies assumptions, information on the allocation approach and treatment of emissions associated with co-products, and elements to assess data quality and the appropriateness of comparisons. General study information was also gathered (e.g., study purpose, reference year, overarching assumptions).

Table 3-2 Attributes Evaluated for Each Study

General	LCA Boundaries	Co-Products
Purpose	Upstream fuels production	Allocation approach
Reference year or years	Flaring/venting	Electricity production from cogeneration
Scope of LCA boundaries	Fugitive leaks	Petroleum coke
Geographic scope	Methane emissions from mine face	Light products (propane, butane)
Functional unit	Methane emissions from tailing ponds	Data Quality Assessment
Method	Mining/extraction	Citation of ISO or other LCA standards
Technology Assumptions	Local land use change	Peer review
Extraction method	Indirect land use change	Completeness
Lift methods	Transport to upgrading	Representativeness
Refinery	Upgrading technology	Consistency
Steam/oil ratio	Transport to refinery	Critical data gaps
Other	Refining	Reproducibility
Equivalencies and Conversions	Distribution to retail	Age of data
Global Warming Potential (GWP) coefficients	Storage	Sources of data
HHV or LHV	Combustion	General Assessment
API gravity	Inclusion of infrastructure or capital equipment	Appropriateness of comparison
		Overall assessment

ISO = International Organization for Standardization, HHV = higher heating value, LHV = lower heating value, LCA = life-cycle analysis.

3.4 REVIEW THE STUDIES AND REFINE THE CRITICAL ELEMENTS

Each of the primary studies was reviewed in depth, with particular attention to the critical elements. Secondary studies were analyzed in less depth. Data, assumptions, or other information related to the critical elements, were recorded, allowing for easier comparison of criteria across the studies.

After the initial review of the studies against the main criteria, a survey of the data and information collected made it possible to identify those elements that were missing from the

initial review or warranted additional attention. For example, the initial review suggested that the treatment of petroleum coke may have a large impact on GHG emissions differences between fuels and studies. Over several iterations, the compiled data and information were analyzed, the criteria were modified to more thoroughly meet the objectives of the analysis, and the studies were reviewed against the enhanced criteria. As preliminary comparisons of the LCA boundaries, study design factors, and input and modeling assumptions were conducted across the studies, key drivers of the results became more apparent, leading to the next step in the analysis.

3.5 EVALUATE THE ELEMENTS ACROSS STUDIES TO IDENTIFY THE KEY DRIVERS OF THE DIFFERENCES IN GHG INTENSITY

Once each study had been reviewed against the refined review criteria, it was possible to compile the relevant emissions estimates, data, and other information to identify the key drivers of the emissions differentials. The key drivers were evaluated across a number of study design factors and assumptions, including, but not limited to, LCA boundaries, time period, allocation methods, crude and fuel types, and functional unit choice. The results were compared across studies where similar design factors and assumptions enabled comparisons to be made between studies. A discussion of the key drivers and the impact they have on the emissions estimates is included in Section 4.4, Analysis of Key Factors and their Impact on WTW GHG Emissions Results.

3.6 SUMMARIZE THE KEY DRIVERS AND PLACE THE GHG EMISSION RESULTS IN CONTEXT

The GHG emission results from NETL were used to evaluate and compare the key drivers and GHG results against the other studies included in the assessment (NETL 2008; 2009). NETL's estimates cover a range of the world crude oils consumed in the United States, including the WCSB oil sands as well as the average crude consumed in the United States in 2005.⁹ Because the NETL-developed emission factors were selected to be a key input to USEPA's renewable fuel regulations, they serve as an important reference case for evaluating life-cycle emissions for different crude sources.

The key findings from this assessment include a summary of the key drivers and the relative impact that these drivers could have on comparisons of life-cycle GHG emissions between WCSB oil sands crudes and reference crudes. As discussed later, the differences across the studies, and—where data were available within the studies—the relative impact that these differences had on the life-cycle results, were also discussed.

4.0 RESULTS AND DISCUSSION

This section presents an assessment of the studies comparing life-cycle GHG emissions from WCSB oil sands crudes to reference crudes. This section is organized to characterize the key factors across the studies and to evaluate their impact on the final results. By organizing it in this

⁹ This 2005 average serves as the baseline in the U.S. Renewable Fuel Standard Program (USEPA 2010a).

way, conclusions are highlighted that are robust across all the studies, and areas where the studies differ are identified.

The discussion starts by introducing the key factors that drive the differences in the life-cycle GHG emission estimates of the studies. The factors belong to two separate groups: (i) study design factors that relate to how the comparison of GHG emissions is structured by each study, and (ii) input and modeling assumptions that are used to calculate the GHG emission results. Study design factors are explained in Section 4.1, Study Design Factors, and input and modeling assumptions are explained in Section 4.2, Input and Modeling Assumptions.

Data quality and transparency issues are then discussed across the studies in Section 4.3, Data Quality and Transparency. This is followed by an analysis of the impact of the key factors on the life-cycle GHG emissions of WCSB oil sands crudes compared to reference crudes. In Section 4.4, Analysis of Key Factors and their Impact on WTW GHG Emissions Results, the NETL studies are used as a basis to evaluate and compare the key study design factors and input and modeling assumptions against the other studies (NETL 2008; 2009). This section provides information on the relative magnitude of impact of each factor, and how each factor contributes to the GHG-intensity of WCSB oil sands crudes relative to reference crudes.

Finally, Section 4.4.3, Summary Comparison of Life-Cycle GHG Emission Results, provides two figures that summarize the relative change in WTW and WTT GHG emissions for gasoline produced from WCSB oil sands crudes relative to each of the four reference crudes in the scope of this assessment.

4.1 STUDY DESIGN FACTORS

Study design factors relate to how the GHG comparison is structured within each study. These factors include the types of crudes and refined products that are compared to each other, the timeframe over which the study results are applicable, the life-cycle boundaries established to make the comparison, and the functional units or the basis used for comparing the life-cycle GHGs for crudes or fuels to each other.

4.1.1 Crude and Fuel Types

The crudes used in LCAs are representative of a crude oil produced from a particular country or region. Most LCAs refer to reference crudes in terms of their country of origin (e.g., Mexico) and the name of the crude (e.g., Maya). The crude's name is meant to indicate a crude oil with specific properties.

The petroleum properties most commonly used to differentiate between crudes are the fuel's American Petroleum Institute (API) gravity, sulfur content, and—less frequently—hydrogen-carbon (H-C) ratio. The API gravity indicates how heavy or light a petroleum liquid is compared to water;¹⁰ a lighter liquid has a higher API gravity. Depending on their weight, crudes are often referred to as light (high API gravity), medium (medium API gravity), and heavy (low API

¹⁰ The API gravity of water is 10. Crude oils or products with API gravity less than 10 are heavier than water (sink in water). Oils with gravities greater than 10 float on water. Heavier crude oils have more residuum (i.e., asphaltic) content and less naphtha (i.e., gasoline) and distillate content. Lighter crude oils have more naphtha and distillate content and less residuum content.

gravity). Generally, crudes with a low API gravity require more energy to refine into premium fuel products such as gasoline, diesel, and jet fuel. Crudes with a low sulfur content are referred to as sweet, while those with a high sulfur content are referred to as sour; the more sour the crude, the greater the energy input required to remove the sulfur. Finally, the H-C ratio is an indicator of the cross-linkage of the hydrocarbon chains of which the crude is composed. Crudes with a lower H-C ratio (i.e., more carbon atoms for each hydrogen atom) will require more energy inputs to refine into premium fuel products.

The relative difference in WTW emissions between two crudes varies greatly depending on the properties of the compared crudes. For example, fuels refined from WCSB oil sands crudes will generally have higher life-cycle GHG emissions than fuels from crudes with higher API, low sulfur content, and higher H-C ratio. The relative difference will be much narrower if the same oil sands crude is compared to a crude with a low API, high sulfur content, and low H-C ratio.

As a result, the properties of the reference, or comparison, crudes against which WCSB oil sands are evaluated are very important drivers behind the final result. LCAs that compare WCSB oil sands to heavier reference crudes will yield a narrow range in life-cycle GHG emissions between the two crudes, while analyses that select lighter reference crudes will show a wider range in GHG emissions. Table 4-1 shows the difference in Venezuelan reference crude fuel properties across three studies as an example. TIAX selected a lighter Bachaquero heavy crude than Jacobs; NETL did not provide specific properties, but evaluated two different Venezuelan blends—a conventional blend that excluded heavy oil extraction and upgrading, and a heavy Venezuelan bitumen (TIAX 2009; Jacobs 2009, 2012; NETL 2009).

Table 4-1 Differences in Reference Crudes Addressed in LCA Studies, as Illustrated by Variations in Properties of Venezuelan Crudes

Study	Crude	Properties	Notes
TIAX (2009)	Venezuela Lake Maracaibo heavy crude	API 17, 2.4% wt sulfur	TIAX selected Bachaquero 17 produced from Venezuela's Lake Maracaibo field as the representative crude oil from Venezuela. The predominant recovery method is thermal recovery with cyclic steam stimulation (CSS) and sucker rod pumping. (TIAX 2009, p. 12)
Jacobs (2009)	Bachaquero - conventional	10.7 API, 2.8% wt sulfur refined into reformulated gasoline (RBOB)	Jacobs selected the heaviest [Bachaquero] blends (p. 6) as the Venezuela reference crude, although several Bachaquero blends are sold, with APIs at 14 and 17 (Jacobs 2009, p. 30).
NETL (2009)	Venezuelan bitumen	API of 7 to 10	While Canada and Venezuela bitumen have similar API gravity (7 to 10 degrees), Venezuela's bitumen has a lower viscosity and a greater reservoir temperature than Canada's. (NETL 2009, p. 6)
	Venezuelan conventional	Not specified	Heavy oil extraction and upgrading is a growing piece of Venezuelan oil production. However, due to limited availability of information, the extraction emissions profile used does not incorporate such activities. (NETL 2008, p. 125)

API = American Petroleum Institute, RBOB = reformulated blendstock for oxygenate blending.

Although the comparisons within each study are internally consistent, the variation in the properties of the reference crudes results in an apples-to-oranges comparison across the different studies. It must be noted that API gravity is not a good measure in comparing synthetic crude oil (SCO) and diluted bitumen (dilbit) because the former is a heart cut product with very little light hydrocarbons and no residuum, while the latter is a dumbbell blend of light hydrocarbons (gas condensate) and bitumen (heavier hydrocarbons). SCO, dilbit, and a full range conventional crude oil may have nearly the same API gravity, but very different energy or GHG intensities to produce a barrel of premium fuel products.

4.1.2 Time Period

The time period over which GHG estimates of WCSB oil sands and reference crudes are valid is a critical design factor. Most studies focused on present conditions or years for which data were available, as shown in Table 4-2. Since the life-cycle emissions of both WCSB oil sands crudes and reference crudes will change over the design lifetime of the proposed Project, comparisons based on current data will not account for future changes that could alter the differential between oil sands and reference crudes.

Table 4-2 Reference Years for LCA Studies

Study	Reference Year(s)
NETL, 2008	2005
NETL, 2009	2005
IEA, 2010	2005-2009 ¹
IHS CERA, 2010, 2011	~2005-2030 ²
NRDC, 2010	2006-2010 ³
ICCT, 2010	2009
Jacobs Consultancy, 2009	2000s
Jacobs Consultancy, 2012	2000s
TIAX, 2009	2007-2009 ⁴
Charpentier et al., 2009	1999-2008 ³
Brandt, 2011	Varies ⁵
GHGenius, 2010	Current ⁶
GREET, 2010	Current ⁷
RAND, 2008	2000s
Pembina Institute, 2005	2000, 2004
Pembina Institute, 2006	2002-2005 ⁸
McCann and Associates, 2001	2007
Rooney et al., 2012	1990s, 2000s
Yeh et al., 2010	2000s

¹ Reference year reflects the publication dates of the report's main data sources.

² Over the past five years the GHG intensity of U.S. oil sands imports has been steady, and is expected to remain steady or decrease somewhat over the next 20 years (IHS CERA 2010, p. 8-9).

³ Based on the dates of the reports NRDC (2010a and b) compiled, the results from each report are likely based on data several years older than the publication date of the reports.

⁴ Oil sands data are chosen to be as close to current as possible. (TIAX 2009, p. 24).

⁵ Varies by study addressed in the meta-study.

⁶ GHGenius contains data representative of current operations, but the model can run projections out to 2050. (Natural Resources Canada 2010)

⁷ GREET contains data representative of current operations and was last updated in 2010 (Argonne National Laboratory 2010).

⁸ Data from studies published from 2002 to 2005 (Pembina 2006, p. 11).

LCA = life-cycle assessment.

Most studies contained data from the mid-to-late 2000s, with one study with a reference year in the 1990s and two sources with reference years as current as 2010. Although IHS CERA (2010) noted that the GHG intensity of U.S. oil sands imports [...] is expected to remain steady or decrease somewhat over the next 20 years, the study did not model future emissions in detail, nor did it comment on changes in the GHG intensity of other reference crudes (IHS CERA 2010, p. 8-9). GHGenius (2010) uses data representative of current WCSB oil sands operations although the model can run projections out to 2050 (Natural Resources Canada 2010).

Many factors will affect the life-cycle GHG emissions of both WCSB oil sands and reference crudes over time. First, GHG emissions from extraction will increase in the future for most reference crudes as it will take more energy to extract crude from increasingly depleted oil fields and to explore for further resources. In comparison, all WCSB oil sands are near the surface. This means that, for surface-mined bitumen, energy requirements are likely to stay relatively constant. At the same time, in situ extraction—which is generally more energy- and GHG-intensive than mining—will represent a larger share of oil sands production in the future. Some analysts also predict that technical innovation will likely continue to reduce the GHG-intensity of SAGD operations (IHS CERA 2010).

For example, Jacobs (2012) investigated several technologies and process improvements that are reducing the carbon intensity of WCSB oil sands crude production. For SAGD production, these include lower steam-oil ratios (SOR) (see Section 4.2.1.2 Steam-Oil Ratio for In-Situ Extraction) and using mechanical lift methods instead of gas lift (Jacobs 2012, p. ES-14). For mining, efficiencies can be realized from using waste heat from the upgrader or on-site electricity generation to heat water used for bitumen extraction, and from paraffin froth treatment that enables bitumen to be refined directly without upgrading (Jacobs 2012, pp. ES-14, 5-48 to 5-51). These efficiencies could reduce the WTW carbon intensity of refined products from oil sands crudes by 7 to 5 percent for in situ and mining extraction methods, respectively (Jacobs 2012, p. ES-14).

Technologies for combusting or gasifying petroleum coke may also become more prevalent in WCSB oil sands operations, which could increase GHG emissions. For example, OPTI/Nexen's Long Lake Phase 1 integrated oil sands project began operation in January 2009 and gasifies heavy ends produced at the upgrader (Nexen 2011).

Over the longer term, carbon capture and storage (CCS) technologies could reduce the GHG footprint of WCSB oil sands crudes. The timeframe for widespread adoption and commercialization of CCS at oil sands facilities is estimated at 15 to 20 years, but the exact timeframe for the transition from demonstration projects to technological maturation remains highly uncertain (Alberta Carbon Capture and Storage Development Council 2009, p. 12). Shell has already begun planning the construction of an oil sands upgrading facility in the Athabasca oil sands which will capture and store 1 million metric tons of CO₂ annually in a deep saline formation; the facility is scheduled to be fully operational in 2015 (D'Iorio 2011). Additionally, the Alberta Government has pledged \$1.5 billion for three large-scale Alberta-based CCS demonstration projects (McQueen 2012).

The Alberta oil sands pose unique considerations for wide-scale implementation. Because WCSB oil sands are located in an area generally not suitable for underground storage, underground storage of CO₂ captured at oil sands facilities would require pipeline infrastructure to transport the CO₂ to suitable underground storage locations (Bachu et al. 2000, pp. 74-76).

Finally, CCS could also be applicable to concentrated streams of CO₂ released from reference crude production facilities, which would also lower the GHG emissions profile of reference crudes to the extent that CCS is applied at these facilities on a commercial scale.

The gap is more likely to narrow than widen between the GHG emissions for WCSB oil sands production relative to other reference crudes. The gap in WTT GHG emissions between WCSB oil sands and reference crudes will narrow as reference crude production becomes more energy intensive, and as the energy intensity of oil sands in situ production becomes more efficient. On the other hand, there is considerable uncertainty regarding the extent to which coke combustion could increase, and the rate of adoption of CCS and development of CO₂ pipeline infrastructure.

4.1.3 LCA Boundaries

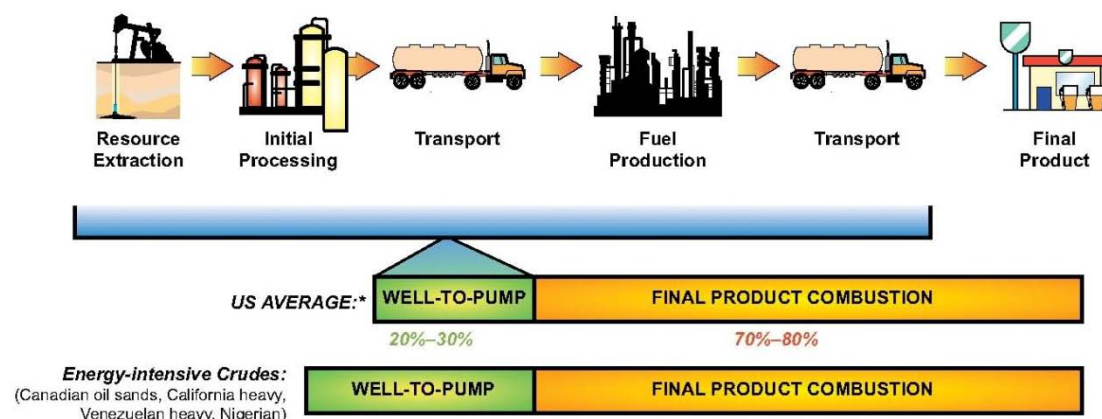
The boundaries of a given LCA describe which sources of GHG emissions are included in the study scope and which are excluded. The following are three common LCA boundaries used in the reviewed studies:

- Well-to-refinery gate (WTR)
- Well-to-tank (WTT) = WTR + refinery-to-tank (RTT)
- Well-to-wheels (WTW) = WTR + RTT + TTW

WTR studies generally include emissions from upstream production of fuels, mining/extraction, upgrading, and transport to refinery. WTT studies generally include emissions of the stages contained in WTR studies, plus refining and distribution. WTW include all stages typically addressed in WTT studies plus emissions from fuels combustion.

Figure 4-1, drawn from the IHS CERA (2010) report, shows the emissions sources typically included in both WTT and WTW boundaries and the relative differences between the WTT emissions from U.S. average crudes and energy-intensive crudes. Regardless of the WTT emissions, final product combustion generally makes up approximately 70 to 80 percent of the WTW emissions and is the same regardless of the crude source.

Table 3-2, located in Section 3.0, Approach, provides the LCA boundaries for each study included in the scope of this assessment. While most studies fall into one of the three categories (i.e., WTR, WTT, or WTW), some studies exclude certain stages. For example, ICCT (2010) included WTT emissions but excluded emissions from the distribution of finished products to the market. These important LCA stage differences across the studies were noted to ensure that comparisons were made across results with the same boundaries (ICCT 2010).



Source: IHS CERA.

*Data source: US Department of Energy, November 2008.
90513-30

Source: IHS CERA 2010

Figure 4-1 Relative magnitude of WTT (i.e., well-to-pump), TTW (i.e., final product combustion), and WTW emissions for U.S. average crudes and energy-intensive crudes

Within each of the life-cycle stages discussed above, specific flows of carbon and GHG emissions are excluded or handled differently across the studies. These flows include the following:

- Upstream energy use and GHG emissions from producing imported fuels and electricity that are purchased from off-site and brought on-site for process heat and power;
- Fugitive methane emissions, emissions from flaring and venting, and—for oil sands operations—methane emissions from the mine face and tailing ponds;
- Releases and storage of carbon associated with land-use change;
- Energy use and GHG emissions from the production of capital equipment and infrastructure; and
- Inclusion of co-products (see Section 4.1.4, Allocation, Co-Products, and Offsets, for details).

These flows tend to be secondary energy and carbon flows that are not directly associated with the primary flows of energy and carbon associated with premium refined fuel products, as defined in the conceptual framework described in Section 2.0, Conceptual Framework, of this appendix. While primary flows are generally consistently included within the LCA boundaries of the studies, the treatment of secondary carbon flows is handled differently across the studies.

An assessment of these flows across each of the studies—and the impact of these differences across studies on the comparability of results—is discussed in detail in Section 4.4, Analysis of Key Factors and their Impact on WTW GHG Emissions Results.

4.1.4 Allocation, Co-Products, and Offsets

Allocation is a method used by LCA practitioners to attribute a portion of the emissions burden to co-products. Co-products are two or more products that are outputs from a process or product system. For example, in a refinery, gasoline, diesel, and jet fuel are all co-products. Other co-products produced from upgrading and refining crude oil can include petroleum coke, liquefied petroleum gas (LPG), sulfur, and surplus cogenerated electricity.

There are three different approaches for handling co-products in LCAs:

1. All co-products can be included within the LCA boundary (also known as system expansion).
2. It may be possible to split or separate a process into two or more sub-processes that each describes an individual product.
3. When the goal of a study is to evaluate a specific co-product (for instance, gasoline independent of diesel, jet fuel, or other co-products), and it is not possible to expand or split the system, it is necessary to allocate a portion of GHG emissions to each co-product, exclude these other co-products from the LCA system boundary, and only consider the GHG emissions associated with making and consuming the co-product of interest.

ISO standards suggest avoiding allocation, when possible, through methods like system expansion and process division. When allocation cannot be avoided, ISO recommends allocating according to the underlying physical relationships between different products.

Allocation of GHG emissions is not necessary in studies that evaluate WTW emissions per barrel of refined products because the LCA boundary includes all the refined products (i.e., gasoline, diesel, jet fuel, as well as coke, LPG, and sulfur). In contrast, studies that evaluate WTW emissions for specific premium fuels such as gasoline, diesel, or jet fuel allocate a portion of the upstream GHGs to each fuel, typically on a fuel energy-content basis. Additionally, these studies may include the GHG burdens from producing co-products such as LPG and coke, to the premium fuel products (i.e., gasoline, diesel, or jet fuel), or they may allocate GHG emissions to these other co-products as well and exclude them from the system boundary.

Comparisons made between the various studies must take into account how co-products are treated in each study. Although individual studies may be internally consistent in how they treat allocation and co-products, the different approaches to accounting for co-products can have a significant impact on life-cycle emissions, and can result in apples-to-oranges comparisons across the studies.

Petroleum coke, LPG, sulfur, and excess electricity from cogeneration (if applicable) are co-products that are produced as a result of producing the premium fuel products of gasoline, diesel, and jet fuel. These co-products are necessary outputs in order to produce premium fuels and would not be produced in the same quantities on their own. As a result, several studies assign a credit for using these lower-value, or secondary, co-products to offset the production and use of other products or fuels. For example, TIAX (2009) included a credit for exported electricity in certain WCSB oil sands production scenarios, assuming that cogenerated electricity is sold to the grid, offsetting natural gas combustion in turbines (TIAX 2009).

Applying offset, or substitution, credits for petroleum coke and exported electricity can have a large impact on WTW GHG emissions. These credits are discussed in more detail in Sections 0 and 4.2.3.1, Cogeneration and Export of Electricity, and Petroleum Coke Treatment. Charpentier noted that emissions intensities can be significantly impacted by the allocation and crediting methods applied to co-products (e.g., coke, sulfur, cogenerated electricity surplus). There has been little attention to these issues in the literature; hence the lack of prior discussion in this paper. However, thorough treatment of these issues will be required in future studies. (Charpentier et al. 2009)

4.1.5 Metrics

Comparing results from different studies is further complicated by each study's choice of functional unit. The functional unit is the basis for comparing GHG emissions across the different crudes and fuels in each study. While GHG emissions are consistently reported in units of carbon dioxide-equivalent,¹¹ emissions are expressed over a wide range of different functional units across the studies.

The studies that evaluated WTT and WTW GHG emissions can be classified into two groups: (i) those that evaluated GHG emissions on the basis of a specific premium fuel product (e.g., gasoline independent of diesel or jet fuel), and (ii) those that evaluated GHG emissions per barrel of all refined products.¹² The choice of functional unit affects how the final results are presented, and makes it challenging to compare across different functional units. For example, NETL used three separate functional units: GHG emissions per megajoule (MJ) of gasoline, per megajoule of diesel, and per megajoule of jet fuel. IHS CERA, in contrast, used GHG emissions per barrel of refined products. These functional units cannot be directly compared to one another, and converting the NETL results to a barrel of all refined products requires a careful review of the underlying allocation methods used to separate the gasoline, diesel, jet fuel, and other co-products.

In addition to using different final product functional units, studies also express results in various units of measurement. For WTR studies, results were given in terms of volume (e.g., per barrel of bitumen, dilbit, or SCO) or energy (e.g., megajoule). For WTT and WTW studies, emissions were given in terms of volume, energy, or distance. Studies using a functional unit of volume provided emissions estimates either per barrel of refined products, or per barrel of a specific refined fuel (e.g., gasoline, diesel, or distillates). Studies using a functional unit of energy

¹¹ As explained in the 2011 Draft U.S. GHG Inventory Report, the IPCC developed the Global Warming Potential (GWP) concept to compare the ability of each greenhouse gas to trap heat in the atmosphere relative to another gas (USEPA 2011). In the U.S. GHG Inventory Report, CO₂ has a GWP of 1, while CH₄ and N₂O have GWPs of 21 and 310, respectively. In this report and many others dealing with GHG emissions, the reference gas used is CO₂, and therefore GWP-weighted emissions are measured in units of CO₂ equivalent (CO₂e). In the studies discussed in this appendix, CO₂ is the predominant GHG emitted, so emissions in units of CO₂e are often nearly equal to the quantity of CO₂ emitted.

¹² IHS CERA (2010) expressed GHG emissions in units of kilograms of carbon dioxide equivalent per barrel of refined product produced, (kgCO₂e per barrel of refined products). Refined products are defined by IHS CERA as the yield of gasoline, diesel, distillate, and gas liquids from each crude. The authors noted that petroleum coke is a co-product of creating the refined products, but did not consider the GHG emissions associated with its combustion. Similar to IHS CERA, IEA (2010) expressed GHG emissions per barrel of crude, assuming the emission from end-use are the same for each crude and equal to those of the combustion of an average crude.

provided emissions estimates per megajoule or Btu and both in terms of higher heating value (HHV) or lower heating value (LHV). Studies using a functional unit of distance provided emissions estimates per km burned in vehicle engine. This wide range of metrics has made comparisons across studies difficult in some instances, necessitating several unit conversions.

4.2 INPUT AND MODELING ASSUMPTIONS

The second set of factors driving the comparisons is input and modeling assumptions that are made at each life-cycle stage. Due to limited data availability and the complexity of and variation in the practices used to extract, process, refine, and transport crude oil, studies often use simplified assumptions to model GHG emissions.

This sub-section summarizes the key input and modeling assumptions in three groups:

1. Factors that affect WCSB oil sands-derived crudes,
2. Factors that affect reference crudes, and
3. Factors that affect both types of crudes.

4.2.1 Factors that Affect Oil Sands-Derived Crudes

Key input assumptions for WCSB oil sands-derived crudes include the type of extraction process (i.e., mining or in situ production); the steam-oil ratio assumed for in situ operations; the efficiency of steam generation, and thus its energy consumption; and—for SCO—the upgrading processes (i.e., pre-refining) modeled and whether estimated downstream refinery GHG emissions account for upgrading.

4.2.1.1 Type of Extraction Process

Two methods of extracting bitumen are currently used in the WCSB oil sands: mining and in situ. Oil sands deposits that are less than 75 meters below the surface can be removed using conventional strip-mining methods and sent for processing. The bitumen is separated from the rock and fine tailings and either blended with diluents for efficient pipeline transport or sent to an upgrader where the bitumen is partially refined into SCO, a lower-viscosity crude oil with lower sulfur content (International Energy Agency [IEA] 2010, p. 149-150; Charpentier et al. 2009, p. 2). Mining accounts for roughly 48 percent of total bitumen capacity in the WCSB oil sands as of mid-2010 (IEA 2010, p. 152).

Oil sands deposits that are deeper than 75 meters below the surface are recovered using in situ methods. Most in situ recovery methods currently in operation involve injecting steam into an oil sands reservoir to heat, and thus decreasing the bitumen's viscosity, enabling it to flow out of the reservoir sand matrix to collection wells. Steam is injected using cyclic steam stimulation (CSS), where the same well cycles between periods of steam injection and bitumen production, or by steam-assisted gravity drainage (SAGD), where a pair of horizontal wells is drilled; the top well is used for steam injection and the bottom well for bitumen production. Bitumen produced from in situ operations is either upgraded into SCO or blended with condensates (to produce dilbit) or blended with SCO (to produce synbit) and sent directly to refineries that can accept raw bitumen (IEA 2010, p. 149-150; Charpentier et al. 2009, p. 2).

GHG emissions vary by the type of extraction process used to produce bitumen. Due to the high energy demands for steam production, steam injection in situ methods are generally more GHG-intensive than mining operations. Table 4-3 shows that across four meta-analyses of WTW GHG assessments, in situ methods of extraction emit between 3 and 9 percent more GHGs than mining.

Table 4-3 Increase in WTW GHG Emissions from In Situ Extraction of Oil Sands Compared to Mining

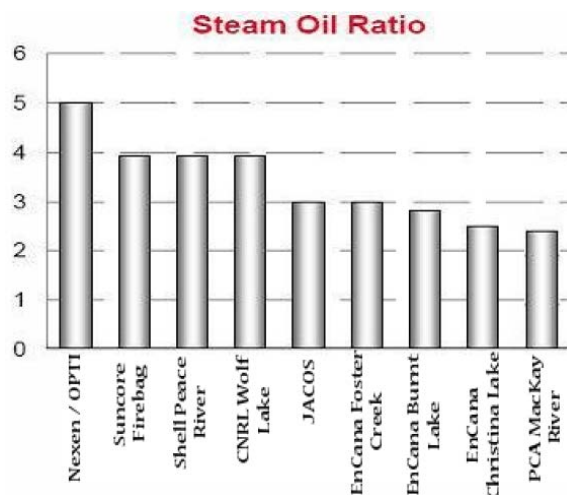
Source	WTW GHG emissions		Units	Percent increase ¹	Notes
	Mining	In situ			
IHS CERA 2010, Table A-8	518.6	554.6	kgCO ₂ /bbl refined products	7%	SCO from in situ compared to mining
NRDC 2010a, p. 2	106	116	gCO ₂ /MJ gasoline	9%	Average estimate for SCO from in situ compared to mining based on a range of literature values
Charpentier et al. 2009, Figure 2	260 to 310	310 to 350	gCO ₂ e/km	3 to 9%	SCO from in situ compared to mining, based on comparison of values from the GHGenius and GREET models
Brandt 2011	109	118	gCO ₂ /MJ of refined fuel delivered	9%	SCO from in situ compared to mining based on GHGenius values

¹ Percent increase in WTW GHG emissions from in situ compared to mining extraction of WCSB oil sands.

gCO₂/MJ = grams carbon dioxide per megajoule, kgCO₂/bbl = kilograms carbon dioxide per barrel, gCO₂e/km = grams carbon dioxide equivalent per kilometer, SCO = synthetic crude oil.

4.2.1.2 Steam-Oil Ratio for In-Situ Extraction

The steam-oil ratio (SOR) is the ratio of steam injected to recover oil in SAGD and CSS operations. It is a measure of the steam volume needed to produce a unit volume of oil. The SOR varies across individual in situ projects, as shown in Figure 4-2 and Table 4-4. The values in Figure 4-2 range from 2.5 to 5.0 across SAGD operations in the WCSB oil sands, while Table 4-4 shows a range of 1.94 to 7.26. In addition, SOR is a function of the price of crude oil and natural gas in the world: the higher the price, the more energy can be justified to produce an increment of crude from each well. In any case, less than 100 percent of the bitumen is recovered and more recovery runs up against diminishing returns for increased cost of energy for steam production.



Source: (S&T)2 Consultants 2008a, p. 18.

Figure 4-2 Reported SORs for SAGD WCSB Oil Sands Projects

Table 4-4 Reported SORs for CSS and SAGD WCSB Oil Sands Projects

Operator	Project	Recovery Method	Annual Bitumen Production (106 x m ³)	SOR (weighted average)
Imperial Oil Resources	Cold Lake	Commercial-CSS	8.20	3.49
EnCana Corporation	Foster Creek	Commercial-SAGD	4.40	2.49
Canadian Natural Resources Limited	Primrose and Wolf Lake	Commercial-CSS	3.58	6.00
Suncor Energy Inc.	Firebag	Commercial-SAGD	2.83	3.13
Suncor Energy Inc.	Mackay River	Commercial-SAGD	1.70	2.52
Devon Canada Corporation	Jackfish 1	Commercial-SAGD	1.30	2.42
ConocoPhillips Canada Resources Corp.	Surmont	Commercial-SAGD	0.85	2.81
Cenovus FCCL Ltd.	Christina Lake	Commercial-SAGD	0.77	2.11
Nexen Inc.	Long Lake	Commercial-SAGD	0.72	5.34
Japan Canada Oil Sands Limited	Hangingstone	Commercial-SAGD	0.43	4.04
Great Divide Oil Corporation	Great Divide	Commercial-SAGD	0.37	3.71
Shell Canada Limited	Peace River	Commercial-CSS	0.36	4.25
Husky Oil Operations Limited	Tucker Lake	Commercial-SAGD	0.22	7.26
Shell Canada Energy	Orion	Commercial-SAGD	0.16	6.43
Meg Energy Corp.	Christina Lake	Commercial-SAGD	0.05	6.54
ConocoPhillips Canada Limited	Surmont Pilot	Commercial-SAGD	0.03	3.41
Total E&P Joslyn Ltd.	Joslyn Creek	Commercial-SAGD	0.03	1.94
Total Industry			26.01	3.58

Source: NRDC 2010b.

CSS = carbon capture and storage, m³ = square meters, SAGD = steam-assisted gravity drainage, SOR = steam-oil ratio, WCSB = Western Canadian Sedimentary Basin.

The SOR is an important parameter because steam production at SAGD and CSS operations dominates energy consumption in the extraction stage. Charpentier (2009) demonstrates that the GHG emissions from SAGD and CSS operations are very sensitive to the SOR. Every 0.5 increase in the SOR corresponds to a six cubic meter increase in natural gas consumption, or an additional 10 kgCO_{2e} per barrel of bitumen produced (Charpentier et al. 2009, p. 7, citing NEB 2006). In addition to SOR, the steam generation efficiency and fuel source are also important factors in overall GHG emissions. Information on steam generation efficiency was not located in all the studies reviewed, however.

Table 4-5 summarizes the SOR assumptions in each study. A number of sources did not provide an estimate for the SOR assumed for in situ operations described in the study, but for those that did, the assumed SOR for SAGD ranges from 2.5 to 3, and the SOR for CSS ranges from 3.35 to 4.8, depending on the project assumptions and the source. These findings suggest that, in general, studies assume that the SOR is higher for CSS operations than SAGD operations.

Table 4-5 SOR Assumptions for In Situ WCSB Oil Sands Operations in Each of the studies reviewed

Study	SOR		Notes
	SAGD	CSS	
NETL, 2008	--	--	
NETL, 2009	--	--	
IEA, 2010	NE	NE	States that the industry norm for in situ operations is approaching 3.
IHS CERA, 2010	3	3.35	
IHS CERA, 2011	3	3.35	
NRDC, 2010	NE	NE	Study notes that it varies by crude, but does not explicitly discuss the values.
ICCT, 2010	NE	NE	
Jacobs, 2009	3	NA	
Jacobs, 2012	2 to 3	NE	Assumed an SOR of 3 is representative of current conditions; SOR of 2 is achievable with new production methods. Also investigated a high-end SOR of 4.
TIAX, 2009	2.5	4.8; 3.4	CSS values are for specific operations using onsite electricity and grid electricity, respectively.
Charpentier, et al., 2009	NE	NE	Depends on the study but this meta-analysis indicated that many studies do not report their assumed SORs.
Brandt, 2011	NE	NE	Depends on the study. SORs from each study included in the meta-analysis are compared to SORs reported in Canada's Energy Resources Conservation Board (ERCB) databases, including (1) from several in situ bitumen production projects in 2009 ranging from 2.49 to 5.99, and (2) the SOR from total thermal in situ bitumen production of 3.18 in 2009.
RAND, 2008	2.5	NA	Study indicates that a high-quality SAGD reservoir has an SOR of ~2.5 but this can vary widely by site or operation. Footnote on page 19 indicates that an SOR of 2.5 is also used in the MIT model used in the analysis.

Study	SOR		Notes
	SAGD	CSS	
Pembina Institute, 2005	NE	NE	
Pembina Institute, 2006	NE	NE	
McCann, 2001	NE	NE	
GHGenius, 2010	3.2	--	
GREET, 2010	--	--	

Note: -- = Not located; CSS = carbon capture and storage, NA = Not Applicable; NE = Not Estimated or Not Stated; SAGD = steam-assisted gravity drainage, SOR = steam-oil ratio.

4.2.1.3 Type of Upgrading Processes Modeled

Upgrading lowers the viscosity of, and removes sulfur from, bitumen before it is transported by pipeline for refining. The resulting product from refining is SCO, essentially a pre-refined crude oil with no vacuum residuum and lower sulfur content. The viscosity of bitumen can be lowered either by removing the heaviest fraction of the oil (residuum) by vacuum distillation or precipitation of asphaltenes, or by adding hydrogen in a hydrocracking process. The vacuum residuum can be further refined in a coking process to produce gasoline and distillate (i.e., premium fuel products) range fractions (blended back into the SCO) and petroleum coke. When vacuum residuum is removed in the upgrader, the SCO produces no vacuum residuum in the receiving refineries, requires no energy intensive vacuum residuum upgrading, vacuum gas oil cracking, or residuum coking. Hence, SCO has a higher gasoline, kerosene, and distillate fuel yield per barrel of crude oil, and thereby requires a relatively lower energy intensity to refine, and does not produce petroleum coke as do all other reference crude oils.

Upgraders that use a portion of the heavy ends (i.e., residuum) or petroleum coke for generating heat, electricity, or hydrogen have a higher GHG emissions intensity than those that combust natural gas for heat and power. Table 4-6 includes data for two upgraders (i.e., Northern Lights and Opti/Nexen) that gasify petroleum coke to produce a synthesis gas (or syngas) that can be burned for process heat or electricity, or used as a hydrogen supply for hydrocracking for sulfur removal. The GHG emissions from these upgraders range from 50 to 500 percent higher than the range of emissions from other upgraders in the table, not including the integrated operations in the last two rows, which includes emissions associated with bitumen extraction, processing, and upgrading. Much of this energy and GHG emissions offset downstream refining emissions for processing SCO.

Gasification is not currently widely employed in the oil sands. Of the two gasification upgraders in Table 4-6, only one is currently operating, representing less than 3 percent of total WCSB oil sands bitumen capacity.¹³ OPTI/Nexen's Long Lake Phase 1 integrated oil sands project gasifies asphaltenes (i.e., heavy ends from upgrading the bitumen into SCO) from the upgrader to produce steam for SAGD, generate electricity, and produce hydrogen for the hydrocracking unit. Initial production of SCO from the upgrader began in January 2009 (Nexen 2011, AERI 2006).

¹³ Production capacity of the first phase of Long Lake is 60,000 barrels of bitumen per day, or 3 percent of the total current WCSB oil sands raw bitumen capacity of 1,923 thousand barrels per day (IEA 2010, p. 152; including both mining and *in situ* operations). As of mid-2010, production was approximately about half of this, or 30,000 barrels of bitumen per day (Nexen 2011).

Table 4-6 Upgrader GHG Emissions per Barrel of SCO¹⁴

Project	Comments	Direct Emissions Intensity kg/bbl	Indirect Emission Intensity kg/bbl	Total Emission Intensity kb/bbl
Scotford Upgrader	Hydrocracking	33.6	5.8	39.4
Scotford Upgrader after Expansion	Hydrocracking	32.9	10.5	43.4
Scotford Upgrader 2	Hydrocracking	60.9	19.1	80.3
Northwest Upgrader	Delayed coking	92.8	Not available	
Northern Lights Upgrader	Delayed coking/gasification	141.4	Not available	
PC Sturgeon Phase 1	Delayed coking	40.7	Not available	
PC Sturgeon Phase 2	Delayed coking	62.6	Not available	
Opti/Nexen	Integrated/gasification	180-200	Not available	
BA Energy	New technology	14.0	Not available	
Husky Lloydminster	Delayed coking	65.6	Not available	
Suncor	Integrated	108.7	Not available	
Syncrude	Integrated	106.0	Not available	

Source: ((S&T)² Consultants 2008a)¹⁴

GHG = greenhouse gases, kg/bbl = kilograms per barrel, SCO = synthetic crude oil.

The second gasification project, the Northern Lights Upgrader, has been placed on hold since 2007. Synenco/SinoCanada had plans to gasify asphaltenes to produce process heat and hydrogen for the hydrocracker unit at a planned upgrading facility outside of Edmonton, Alberta. The upgrader would have received bitumen via pipeline from Synenco/Total's Northern Lights Oil Sands Project near Fort McMurray, Alberta (Edmonton Journal 2007, Sturgeon County 2011).

Coking or hydrocracking upgrading technologies have a small effect on WTW GHG emissions estimates, and reported emissions vary by each project. Jacobs (2009) estimated that hydrocracking using an ebulating bed hydrocracking unit increases WTW GHG emissions by 2 percent compared to coking for gasoline produced from SAGD-extracted SCO. (S&T)² Consultants (2008a) provided estimates of direct (i.e., on-site) and indirect (i.e., upstream fuel and electricity production) GHG emissions from various operating, planned, and on-hold upgraders in Alberta ((S&T)² Consultants 2008a, p. 25). The data in Table 4-6 show that direct emissions from delayed coking range from 40.7 to 92.8 kgCO₂e per barrel of SCO, while GHG emissions from hydrocracking range from 33.6 to 60.9 kgCO₂e per barrel. This has to be put into perspective with SCO yielding up to 60 percent gasoline in the downstream refinery as compared to conventional full-range crudes which may yield up to 40 percent gasoline with higher GHG intensity.

¹⁴ Suncor and Syncrude's integrated operations include GHG emissions from bitumen extraction, processing, and upgrading ((S&T)² Consultants 2008a, p. 26).

4.2.1.4 Electricity Cogeneration and Export

Cogeneration facilities generate both steam and electricity simultaneously to achieve higher efficiencies than if each were generated separately. Facilities are sized to meet the steam requirements for oil sand extraction, processing, and upgrading requirements. For facilities where steam requirements are greater than for electricity, this leaves an excess capacity for electricity generation that can be exported for use elsewhere on the electricity grid (IHS CERA 2010, pp. 16-18; Jacobs 2009, p. 12).

The treatment of exported electricity in LCAs is a study design factor that is discussed separately in Section 4.1.4, Allocation, Co-Products, and Offsets. The specific input assumptions related to electricity exports have a substantial impact on the WTW GHG emissions of oil sands-derived crudes relative to reference crudes.

Cogeneration assumptions vary across the studies in two ways: whether cogeneration is included, and if so, the assumed source of electricity generation that is offset by electricity cogenerated at oil sands facilities. Jacobs (2009) illustratively¹⁵ demonstrated that applying a credit for offsetting grid electricity with electricity cogenerated at oil sand facilities could reduce the WTW GHG emissions for oil sands crudes to the range of reference crudes (Jacobs 2009, p. 8-17).¹⁶

Jacobs (2012) did not apply a credit for exporting excess electricity generated at SAGD or upgrading facilities (Jacobs 2012 p. 4-18). In calculating the carbon intensity of production from SAGD processes using reports to the Alberta Energy Conservation Board for facilities that export electricity, the study calculated the natural gas amount that would be used to produce the excess electricity and subtracted this from total natural gas consumption (Jacobs 2012 p. 5-36).

IHS CERA (2010) estimated that electricity exports could reduce the WTW GHG emissions by 1 to 2 percent per barrel of refined products from SAGD bitumen (IHS CERA 2010, pp. 16-17). The authors calculated this range by evaluating a case where oil sands electricity exports offset coal-fired generation on the grid and a case where the offset is equal to the Government of Alberta's offset credit for renewable power generation.

TIAX (2009) included project-specific data on electricity exports from Suncor Energy's MacKay River and Canadian Natural Resources Limited's (CNRL) Primrose in situ oil sands projects in Alberta (TIAX 2009, pp. 27-28). Combined, these projects account for roughly 8 percent of total bitumen capacity in the WCSB oil sands.¹⁷ TIAX assumed that electricity exported to the grid offset electricity that would have been generated by natural gas combined-cycle turbines. Contrary to Jacobs (2009) and IHS CERA, TIAX concluded that exporting cogenerated electricity increased WTW emissions per megajoule of reformulated gasoline by 2 to 6 percent for synbit and dilbit from SAGD and CSS (TIAX 2009, pp. 66, 76).

Finally, in a 2008 update to the GHGenius model, (S&T)2 Consultants removed a cogeneration credit that was previously applied to integrated oil sands extraction and upgrading facilities.

¹⁵ Jacobs (2009) did not comprehensively evaluate cogeneration opportunities at oil sands facilities, but included a preliminary, illustrative analysis and recommended further investigation of cogeneration.

¹⁶ Jacobs (2009) evaluated a series of scenarios that varied the level of electricity export and whether natural gas-fired electricity or 80 percent coal-fired electricity was displaced by the exported electricity for SAGD operations.

¹⁷ Based on 1,923 thousand barrels per day of total raw bitumen capacity in the WCSB oil sands (IEA 2010, p. 152). CNRL's Primrose project has a raw bitumen capacity of 120 thousand barrels per day (IEA 2010, p. 152), while MacKay River has a capacity of 33 thousand barrels per day (Oil Sands Developers Group 2009).

((S&T)2 removed the credit because they were unable to locate evidence that Suncor and Syncrude's integrated oil sands projects were selling power to the local grid ((S&T)2 Consultants 2008a, p. 26). It was unclear whether other studies in the scope of this evaluation considered electricity exports in their results.

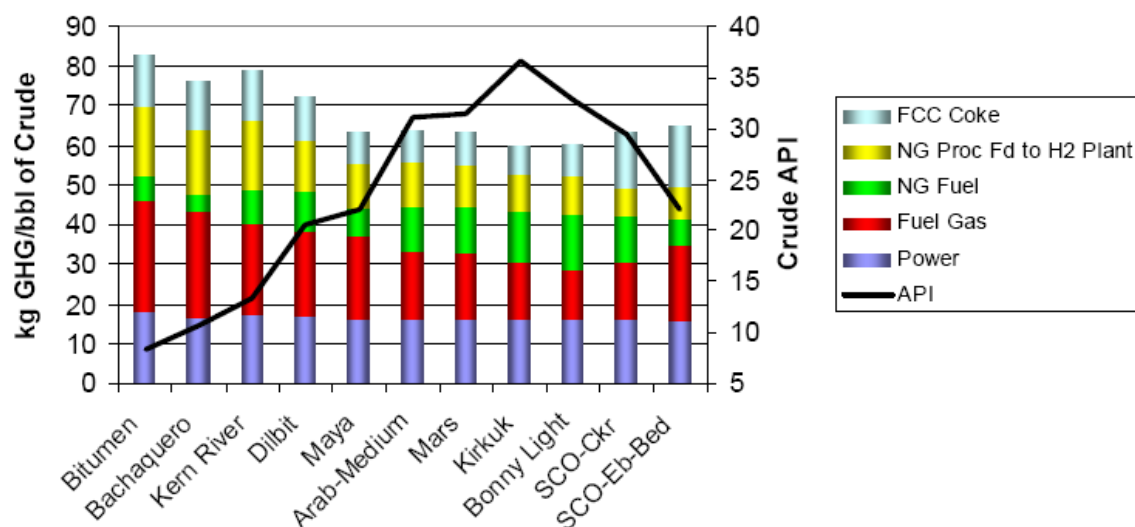
4.2.1.5 Accounting for Upgrading in Refining Emissions Estimates

A barrel of SCO delivered to a refinery has already been processed at the upgrader, and will produce greater quantities of premium fuel products (i.e., gasoline, diesel, and jet fuel), no heavy residuum, and less light ends than a barrel of full-range reference crudes that have not already undergone upgrading. As a result, the energy consumption, and therefore GHG emissions, from refining SCO into a barrel of premium fuel products is lower than that for producing the same amount of premium fuels from virtually all other crudes.

Accounting for the reduced GHG emissions from refining SCO relative to other crudes has a modest effect on WTW GHG emissions, as refinery emissions are roughly 5 to 15 percent of WTW GHG emissions (based on Figure 5.3 in IEA 2010 and Table A-8 from IHS CERA 2010). However, the effect is more significant on a WTT basis. Studies that do not account for the reduction in refinery energy use for SCO will overestimate the GHG emissions from SCO relative to other crude sources.

TIAX (2009) and Jacobs (2009) used refinery models to estimate the GHG emissions at the refinery. TIAX found that refinery energy consumption for SCO was significantly lower than for other crude oils (TIAX 2009 p. 34). The Jacobs (2009) results, shown in Figure 4-3 below, estimated that the GHG emissions to refine a barrel of SCO were on the order of GHG emissions to refine Mexican Maya or Arab Medium crude oil. Note, however, that the Jacobs results are given in terms of refining one barrel of input crude, not in terms of the GHG emissions from producing an equivalent amount of premium fuel products from different crudes and SCO; since SCO produces more premium fuel products per barrel of input than other crudes, GHG emissions from refining SCO are even lower when compared on a per-barrel of premium fuel products basis.

Other studies did not account for this effect in their estimates, or it was unclear whether refinery emissions were adjusted to account for upstream upgrading. NETL (2009) and ICCT (2010) correlated refinery emissions with API gravity, and although NETL noted this limitation, the authors did not evaluate the effect that upgrading would have on SCO GHG emissions at the refinery (NETL 2009, p. 11; ICCT 2010, p. 8, 26). As stated earlier, correlating GHG emissions with API gravity does not account for the intensity of refining SCO or dilbit on a per barrel of premium fuel products basis because these crudes have a different composition of light and heavy ends than other full-range crudes. The IHS CERA (2010) meta-analysis estimated that refining SCO would emit 11 percent more GHGs than refining West Texas Intermediate crude per barrel of refined products; since emissions from refining SCO should be lower than refining other full-range crudes, the study may not have accounted for the reduced GHG emissions per barrel of premium fuel product when refining SCO compared to a conventional crude (IHS CERA 2010, Table A-8; 2011, Table A-7). The report prepared for the oil sands pathways within the GHGenius model did not provide the assumptions for refining SCO into premium fuel products ((S&T)2 Consultants 2008a).



Source: Jacobs 2009, p. 5-41.

Note: Results only include GHG emissions from refining and do not include emissions from upgrading SCO. API = American Petroleum Institute, FCC = fluid catalytic cracker, GHG = greenhouse gases, H2 = hydrogen, NG = natural gas SCO = synthetic crude oil.

Figure 4-3 GHG emissions for refining one barrel of different crudes, SCO, dilbit, and bitumen, by fuel source

4.2.1.6 Dilbit and Accounting for Diluents

Because raw bitumen viscosity is too high to be transported via pipeline, a portion of the bitumen produced from in situ extraction in the WCSB oil sands is diluted with light hydrocarbons (typically natural gas liquids, or condensates, from natural gas and SCO production). This allows sending the bitumen via pipeline to refineries for refining into products such as gasoline, diesel, and jet fuel without needing upgrading into SCO (IEA 2010, NRDC 2010b).

Accounting for the effect of diluting bitumen with condensate has a moderate effect on emissions estimates for two reasons. First, producing and refining condensate from natural gas or SCO into finished products emits fewer GHG emissions per barrel of crude transported in the pipeline than bitumen, so blending the two together results in lower WTW GHG emissions than the same volume of raw bitumen. NRDC (2010b) estimates that this results in roughly a 6 percent decrease in the WTW GHG emissions of dilbit relative to raw bitumen (NRDC 2010b, p. 3). However, if the metric used to compare the GHG emissions from WCSB oil sands crudes is GHG emissions per barrel of premium fuel product, dilbit would have a higher GHG intensity than either SCO or bitumen (not counting bitumen transportation) since the diluents represent 30 percent of the transported dilbit and do not refine into premium fuel products. On an equivalent basis of a barrel of gasoline plus distillate, the transportation GHG intensity would be approximately two times higher for dilbit compared to SCO if the condensate is considered, because the condensate and residuum each represent 30 percent.

Table 4-7 compares the WTW emissions from dilbit to bitumen and SCO from various studies. When the diluent condensate is refined with the bitumen at the refinery, WTW GHG emissions for dilbit are approximately 4 to 7 percent less than for bitumen, based on results from TIAX (2009). Jacobs (2009, 2012) examined scenarios where the diluent is separated from bitumen at the refinery and recirculated back to oil sands facilities in Alberta. The results were similar in both studies; WTW GHG emissions were 6 to 7 percent higher when diluent is recirculated back to Alberta than if the diluent is refined with the bitumen. The estimates where diluent is refined with the raw bitumen at the refinery are representative of the proposed Project, since diluent will not be recirculated by the pipeline. These studies do not appear to give adequate credit for lower refining GHG emissions of SCO as compared to bitumen or dilbit, which each have about 30 percent vacuum residuum, while SCO has the vacuum residuum removed in the upgrader.

Table 4-7 Comparison of WTW GHGs per MJ of Premium Fuel Products Refined from Dilbit, Bitumen, and SCO

Study	Extraction method	Feedstock	WTW GHG emissions (gCO ₂ e/MJ ¹)	Percent change ²	Notes
TIAX (2009)	SAGD	Bitumen	109	--	
		SCO	111	2%	SCO from SAGD assuming coke is buried
	CSS	Dilbit, no recirculation	101 to 105	-4 to -7%	Low end includes a credit for electricity cogeneration
		Dilbit, no recirculation	105 to 111	--	Low end includes a credit for electricity cogeneration
Jacobs (2009)	SAGD	SCO	116 to 119	--	Low end assumes delayed coking; high end assumes hydrocracking
		Dilbit, no recirculation	113	-3 to -5%	Diluent is separated at refinery and recirculated to Alberta
		Dilbit, recirculation	106	-9 to -11%	Diluent is processed with bitumen at the refinery
Jacobs (2012)	SAGD	Dilbit, no recirculation	111	--	Diluent is refined in a high conversion U.S. Gulf Coast refinery and is not returned to Alberta
		Dilbit, recirculation	105	-6%	Diluent used to ship bitumen to a high conversion U.S. Gulf Coast refinery is returned to Alberta
GHGenius, (S&T) ² Consultants (2008a)	SAGD	Bitumen	114	--	
		SCO	118	4%	
	CSS	Bitumen	112	--	
		SCO	116	4%	

¹ WTW GHG emissions are in terms of grams CO₂ equivalent per megajoule of reformulated gasoline.

² Percent change in WTW GHG emissions relative to bitumen, except for Jacobs (2009), which is the percent change in WTW GHG emissions relative to SCO.

gCO₂e/MJ = grams carbon dioxide equivalent per megajoule, GHG = greenhouse gas, SAGD = steam-assisted gravity drainage, SCO = synthetic crude oil, WTW = well-to-wheels.

Second, diluting raw bitumen with light hydrocarbons creates a dumbbell blend that contains a high fraction of heavy residuum and light ends, with relatively low fractions of hydrocarbons in the middle that can be easily refined into premium fuel products. As a result, producing one barrel of premium fuel products (i.e., gasoline, diesel, and jet fuel) requires more dilbit input and produces more light ends and petroleum coke than refining one barrel of premium fuel products

from other crudes and SCO. This results in additional energy use and GHG emissions from refining the dilbit, and producing, distributing, and combusting the light- and heavy-end co-products.

The extent to which this difference in yield of premium fuel products is accounted for in these studies is unclear. IHS CERA's (2010, 2011) estimate for crude production of SAGD dilbit does not appear to adjust GHG emissions per barrel of refined products output for the difference in yield.¹⁸ TIAX (2009) and Jacobs (2009) both show higher refinery emissions for dilbit and synbit on a barrel-of-input-crude basis, but it is not clear to what extent the effect of dumbbell blend yields on refining GHG emissions is accounted for in the refinery models that these studies used.

4.2.2 Factors that Affect Reference Crudes

For the reference crudes, key input assumptions include the oil-water and gas-oil ratios that are used to estimate reinjection and venting or flaring assumptions (e.g., stranded gas versus recovered gas, control levels on venting sources, the allocation of venting/flaring emissions to crude versus produced natural gas), and whether—and what type of—artificial lift (e.g., gas lift, water, steam, CO₂ flood) is considered for extracting crude oil.

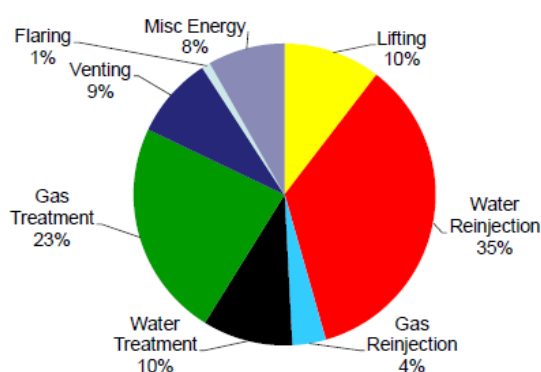
4.2.2.1 Artificial Lift Assumptions

The methods of producing oil from wells drilled into an oil reservoir evolve over the reservoir's lifetime. There are generally three phases of production from a reservoir: primary, secondary, and tertiary. Primary recovery relies on the initial pressure of the oil reservoir itself to lift the oil through evolution of dissolved gas, much like a carbonated beverage foams liquid up the neck of a bottle. Thus primary recovery requires no energy input for extraction. Secondary recovery involves pumping or injecting gas or water into the reservoir to sweep or push out additional oil. In tertiary recovery, steam or CO₂ is injected to loosen the remaining oil adhering to the reservoir solids by lowering its viscosity and swelling its volume to enable it to flow or be pushed out of the reservoir with a water flood. For a given field, GHG emissions intensity increases dramatically through this evolution of recovery techniques. Even the best tertiary recovery techniques known today leave more than 50 percent of the original oil in the ground whereas mining oil sands captures virtually 100 percent of the oil contained in the sand matrix.

The GHG emissions from crude oil production are driven by the methods used to lift the oil out of the ground and produce the oil, and there is significant sensitivity to assumptions about artificial lift, oil, gas, and water separation, and water and gas reinjection practices. IHS CERA documented a wide range in GHG estimates for production of several reference crudes; estimates for Saudi Medium crude ranged from 1 to 25 kgCO₂e per barrel of refined products (IHS CERA 2010, Table A-1). Studies that do not account for lift and associated treatment and reinjection energy requirements will underestimate the GHG emissions from reference crude production relative to oil sands-derived crudes.

¹⁸ GHG emissions for crude production from SAGD dilbit are roughly 70 percent of emissions from SAGD SCO, suggesting that the value is a simple 70/30 ratio of bitumen to dilbit per barrel of refined products. If so, this would not reflect the fact that more bitumen is required to produce the same barrel of refined products than SCO.

Jacobs (2009, 2012) used a crude production model to estimate GHG emissions associated with producing different types of reference crudes. A representative breakdown of the major sources of GHG emissions is shown in Figure 4-4. Similarly, TIAX (2009) considered different lift methods to determine oil production energy use and GHG emissions, as shown in Table 4-8 (TIAX 2009, p. 4). The study used data from different sources to quantify emissions for each crude, and relied on NETL (2008) to estimate grid electricity consumption for several of the crudes modeled. These studies do not appear to evaluate the delivery of water from the Arabian Gulf to the principal Saudi oil field (Ghawar), nor do they appear to evaluate transporting the produced Arab Light crude to the stabilization plant, from the stabilization plant to the shipping terminal, or loading the crude onto the oil tankers. Hence these studies appear to underestimate the Saudi crude production energy in the initial phase of the life cycle from reservoir to freight onboard a tanker.



Source: Jacobs 2012, p. 5-17.

Figure 4-4 Illustrative break-down of major sources of GHG emissions from production of a generic crude oil¹⁹

Table 4-8 Crude Oil Recovery Methods

Label	Crude Name	Recovery Methods
Alaska	Alaska North Slope	Water Alternating Gas (WAG) and Natural Drive
California Heavy	Kern County Heavy Oil	Steam Injection, Sucker Rod Pumps
Texas	West Texas Intermediate	Water Flooding, Natural Drive
Canada Heavy	Bow River Heavy Oil	Water Flooding, Progressive Cavity Pumps
Iraq	Basrah Medium	Water Flooding, Natural Drive
Mexico	Maya (Canterell)	Nitrogen Flooding, Gas Lift
Nigeria	Escravos	Water Flooding, Gas Lift
Saudi	Saudi Medium	Water Flooding, Natural Drive
Venezuela	Bachaquero (Maracaibo)	Cyclic Steam Stimulation, Sucker Rod Pumps

Source: TIAX 2009, p. 64

¹⁹ The crude oil modeled in this scenario is at 30 API in a reservoir at 5,000 feet. The gas-oil ratio is 1000 standard cubic feet of gas per barrel of oil, and 10 barrels of water are produced to one barrel of oil (Jacobs 2012, p. 5-17).

Crude oil production estimates in NETL (2008) accounted for artificial lift methods (NETL 2008, Attachment 1). The production value of 13.6 kgCO₂ per barrel of crude for Saudi Arabia, however, is roughly half that of Jacobs (Jacobs 2012, Figure 5-7).²⁰ It is not clear if this difference is a result of different assumptions in baseline crudes, or whether the NETL (2008) estimate accurately accounted for shipment and treatment of off-site water used for injection into the reservoir, crude stabilization, or transport to the terminal and loading onto tankers.

4.2.2.2 Sensitivity to Water-Oil and Gas-Oil Ratios

Water-oil and gas-oil (GOR) ratios describe the fraction of the flow from a well that is oil, water, or gas. Several studies use these ratios to develop simplifying relationships between energy use and GHG emissions and oil reservoir characteristics. This simplifying assumption is often necessary due to the complex nature of oil production systems and reservoir characteristics; however, it also causes the studies to become sensitive to variations in these factors, or circumstances where the relationships may not fully apply.

For example, ICCT (2010) derived the volume of gas flared from GOR, energy use in the field, and the quantity of gas exported as well as other data sources from NOAA and the World Bank's Global Gas Flaring Reduction program (ICCT 2010, p. 14). This may overstate the flaring amount depending on the extent to which gas is reinjected to maintain reservoir pressure. It is important to ensure that the disposition of gas is accurately reflected in calculated emissions from flaring since not all the gas produced from the well may be flared. To the extent that natural gas (primarily methane) is vented rather than flared, this can have a significant effect on GHG results, as the GWP of methane is more than 20 times higher (estimates vary from 21 to 23 depending on which IPCC assessment report is cited) than that of CO₂.

4.2.3 Factors that Affect Both Reference and Oil Sands-Derived Crudes

Across both WCSB oil sands and reference crudes, assumptions about how much petroleum coke is produced, stored, and combusted at the upgrader or refinery, and how much is sold to other users, is a key driver of GHG emissions; transportation assumptions have a more limited effect, but vary across the studies.

4.2.3.1 Petroleum Coke Treatment

Petroleum coke, discussed further in Section 6.0, is a co-product produced by thermal decomposition of vacuum residuum into lighter hydrocarbons during bitumen upgrading and crude oil refining (see Figure 2-1). Petroleum coke is approximately 95 percent carbon by weight. In contrast with the premium products the refinery produces, coke is an undesirable co-product that has very low demand in the U.S. marketplace and is therefore shipped to overseas markets, primarily China. Roughly 5 to 10 percent by volume of a barrel of crude ends up as coke. Heavier crudes will produce a larger fraction of coke than lighter fuels. Venezuela Bachaquero, Mexican Maya, and dilbit produce about 50 percent more coke than average U.S. 2005 crude or Saudi Light crude. Since SCO has had all the vacuum residuum removed in the upgrader before it reaches the refinery (TIAX 2009, Appendix D, p. 17), it has no petroleum

²⁰ Jacobs (2012) estimates approximately 4 gCO₂/MJ of crude for Saudi Arabian Medium, or 24 kgCO₂/bbl assuming 6.119 GJ/bbl crude oil (Jacobs 2012, Figure 5-7).

coke manufactured in downstream refineries, or petroleum coke transportation and combustion emissions as do all other reference crudes processed in refineries, i.e., U.S., Mexican, Venezuelan, or Saudi crudes.

The treatment of coke is a primary driver behind the comparisons of WTW GHG assessments of oil sand-derived crudes relative to reference crudes. For example, TIAX found that coke combustion could increase WTW emissions by 14 percent, and Pembina estimated that coke gasification at the upgrader could account for a 50 percent increase in GHG emissions from extraction and upgrading bitumen (TIAX 2009, p. 66, 76; Pembina 2006, p. 11). IHS CERA (2010) found that if petroleum coke combustion is included, TTW combustion emissions of refined crude increase about 13 percent (from 384 to 432 kgCO₂e/barrel). As shown in Table 4-6 above, data from planned and operational upgraders in Alberta show that gasification of petroleum coke and other heavy ends substantially increases GHG emissions. These examples demonstrate the significance of coke assumptions in WTW emission estimates.

The main concern in modeling GHG emissions from petroleum coke is ensuring that coke produced at the upgrader is treated consistently with coke produced at the refinery.²¹ Table 4-9 summarizes the assumptions applied by several studies within the scope of this assessment to petroleum coke generated at both upgrading (from bitumen into SCO) and in refineries (from refining crude oil and bitumen into refined products). The NETL (2008), IHS CERA (2010 and 2011), and GHGenius ((S&T)2 Consultants 2008a) studies do not specifically state how petroleum coke is treated at upgraders and refineries, respectively, making it difficult to determine what assumptions about petroleum coke combustion were applied.

Table 4-9 Assumptions Regarding Petroleum Coke Produced at Upgraders and Refineries in Different LCA Studies

Study	Petroleum coke from upgrading bitumen at the upgrading facility	Petroleum coke from reference crudes or bitumen at the refinery
NETL 2008	Not stated	GHG emissions from producing coke are allocated to the coke product itself. Combustion of marketable coke leaving the refinery is not included. Refinery emissions do include petroleum coke burned as catalyst in the refinery.
Jacobs 2009, pp. 10, 16, 8-3	Coke is stored, not used as fuel. Report recommended further study into upgrading technologies that use coke for energy supply.	GHG emissions from producing coke are allocated to the other premium fuel products. Coke is sold as a substitute for coal in electricity generation.
Jacobs 2012, pp. 6-3, 9-4 to 9-23	Coke produced at the upgrader is stored and not subject to further conversion.	GHG emissions from producing, refining, and transporting coke are allocated to the premium fuel products. A credit is applied for coke combustion, assuming it displaces coal for an incremental increase of 2 gCO ₂ /MJ of refined fuel.
TIAX 2009, pp.	Does not include combustion emissions	GHG emissions from producing coke are

²¹ The allocation rules that studies apply to petroleum coke are a study design factor that is addressed in Section 4.1.4, Allocation, Co-Products, and Offsets. In addition to allocation rules, however, the assumptions about how coke is managed by upgraders and refineries are important factors governing the results of WTW GHG emissions assessments.

Study	Petroleum coke from upgrading bitumen at the upgrading facility	Petroleum coke from reference crudes or bitumen at the refinery
48, G-6	from coke. Only considers how to allocate upstream emissions associated with producing the coke. Evaluates three scenarios: use (SAGD-only), bury, and sell coke. If sold, TIAX allocates GHG emissions to the production of coke; no credit is included for offsetting coal combustion.	allocated to the other premium fuel products. Coke combustion is not included.
IHS CERA 2010, p. 36; IHS CERA 2012, p. 17-18	Unclear to what extent emissions from use of coke are included.	Excludes coke from combustion emissions.
IEA 2010	Not stated	Not stated
McCann 2001, pp. 4, 5	Not clearly stated. Appears that coke is combusted at the upgrader in at least one of the data sources used.	Coke was assumed to offset natural gas at the refinery.
RAND 2008	Not stated	Not stated
Pembina 2006	Gasification of coke was included in high-emission scenarios for hydrogen production for upgrading.	Not stated
GHGenius - (S&T) ² 2008a, Table 6.6, p. 25	Coke is used at the upgrader, contributing to 15% of energy requirement or 1,100 MJ per metric ton of upgrading SCO. Remaining coke and LPG not combusted at upgrader is assumed to offset emissions from coal combustion at electric generating units.	Not stated

gCO₂/MJ = grams carbon dioxide per megajoule, GHG = greenhouse gas, LCA = life-cycle assessment, LPG = liquefied petroleum gas, MJ = megajoule, SAGD = steam-assisted gravity drainage, SCO = synthetic crude oil.

The fates of petroleum coke are influenced by market effects and access to markets, and differ depending on whether petroleum coke is produced at WCSB oil sands facilities in Alberta or at U.S. Gulf Coast refineries. Based on Table 4-9, the basis of the studies is that petroleum coke produced by upgrading bitumen into SCO is either: (i) combusted (for process heat, electricity, or hydrogen production); (ii) stored; or (iii) sold as a fuel for combustion. In contrast, the studies assume that petroleum coke produced at refineries that is not combusted by the refineries themselves (it is the rare case in the United States that petroleum coke is combusted by a refinery) is either (i) used to supplement coal combustion for electricity generation or (ii) that the emissions associated with producing and combusting the coal are allocated outside the assumed life-cycle system boundary. Excess petroleum coke produced from PADD III refineries is typically shipped to Asia where it is combusted for electricity generation.

These factors are influenced by market interactions involving petroleum coke supply relative to the availability of other competing fuel substitutes. These dynamic market effects are difficult to characterize and are generally not explicitly modeled in existing life-cycle assessments (Brandt 2011, Jacobs 2012). The consumption of petroleum coke at WCSB oil sands facilities may be influenced by the availability of low-cost natural gas to these facilities, while transporting raw or diluted bitumen to refineries in the Gulf Coast that sell coke to other markets may therefore cause a greater share of the coke to be combusted rather than stockpiled (Brandt 2011).

None of the studies included in this assessment's scope provide information on industry-averaged petroleum coke management practices at oil sands operations. Jacobs (2009, 2012)

assumed that all coke is stockpiled, noting that the practice of storing coke is typical and that the transport costs of marketing the material from Alberta exceed its value (Jacobs 2009, p. 4-10). In contrast, TIAX examines three scenarios where petroleum coke at upgraders is either used as a fuel, sold as a product, or buried. In comments to TIAX's report, Suncor Energy noted that 34 percent of the coke generated by upgrading bitumen is combusted in SCO production and that the rest is sold or stockpiled (TIAX 2009, p. G-3). As noted in Section 4.2.1.3, Type of Upgrading Processes Modeled, OPTI/Nexen's Long Lake Phase 1 integrated oil sands project currently gasifies asphaltenes from the upgrader for process heat, electricity, and hydrogen.

4.2.3.2 Transportation Emissions

Transportation GHG emissions arise from the transport of bitumen, SCO, and crude to U.S. refineries, the distribution of refined premium fuel products (e.g., gasoline, diesel, and jet fuel) to end use in the United States, and from the transport of light- and heavy-end co-products such as LPG and petroleum coke to markets for these fuels.

Transportation emissions have a small to moderate effect on WTW GHG emissions. IHS CERA (2010) found that transportation emissions make up less than 1 percent of total WTW emissions (IHS CERA 2010, p. 34). The study also documented considerable variation in transportation estimates, ranging from 1 to 14 kgCO₂e/bbl for crude transportation from Mexico.

Although the contribution of transportation GHG emissions to WTW GHG emission is minor, transportation emission calculations should account for the distance and modes of transportation—including domestic transportation from the oil field to an export terminal in the case of international crudes—and include transportation emissions for all products produced from bitumen, crude, or SCO for a given amount of premium fuel products produced from the refinery. The variation in transportation estimates across different studies may result from different approaches to modeling transportation emissions, or an incomplete consideration of the full supply chain from field to refinery.

4.2.3.3 Land Use Change Emissions

Land use change emissions refer to the life-cycle GHGs emitted via human activities, such as development, deforestation, and other physical impacts to the land. These can include immediate GHG releases from land disturbance as well as long-term changes to GHG sequestration patterns from changes in ecosystems. The land use changes resulting from WCSB oil sands development include the development of infrastructure, deforestation, and disturbance of peat-forming marshland to facilitate petroleum extraction. Many studies, however, exclude the life-cycle GHG emissions from land use change associated with oil sands extraction (NETL 2009, IHS CERA 2010 and 2011, Jacobs 2009, TIAX 2009), although Jacobs (2012) and GHGenius (2010) have used recent assessments to estimate emissions from local land use changes related to WCSB oil sands development. Consequently, the carbon flux from land use changes is currently poorly characterized in the body of life cycle literature on oil sands-derived crudes. Recent studies (Rooney et al. 2012, Yeh et al. 2010) have sought to characterize these carbon flows to examine the implications for GHG emissions and carbon sequestration.

Carbon is sequestered and stored in several land-based stocks, including above- and below-ground biomass (i.e., biomass carbon stocks), and soil organic carbon (i.e., soil carbon stocks). Extraction of both conventional crudes and bitumen and the subsequent reclamation of extraction sites affect the levels of carbon in these stocks through several key carbon flows. These include

immediate carbon release from land clearance and soil disturbance, foregone carbon sequestration, and carbon uptake during land reclamation. Foregone sequestration refers to the carbon which would have been sequestered had a land-based carbon sink, such as a peatland, not been cleared for development.

Table 4-10 provides estimates of carbon stocks, carbon sequestration rates, and land reclamation rates for Canadian boreal forests and peatlands from Rooney and Yeh. The studies conclude that oil sands developments will result in net releases of carbon from land-based stocks through the following mechanisms:

- Release of carbon stored in forest and peatland biomass and soil carbon stocks, which is only partially replaced by the uptake of carbon during reclamation of the disturbed land post-development; and
- Forgone carbon sequestration in peatlands, which would otherwise sequester carbon at annual rates between 0.17 to 0.24 metric tons of carbon per hectare.

Table 4-10 Carbon Stock Estimates, Long-Term Carbon Sequestration Rates, and Land Reclamation Rates for Canadian Boreal Forests and Peatlands

Carbon pool	Land type		Rooney et al. 2012		Yeh et al. 2010	
			Value	Source	Value	Source
Original carbon stocks (metric tons C/ha)	Biomass		--	--	90	Table S5, see footnote; Searchinger et al. 2008
	Forest soil		--	--	206	
	Peatland biomass		Included	See p. 4; included in peatland soil estimate	36	Table S5, see footnote; Wieder et al. 2009
	Peatland soil	Low	530 ¹	See p. 4, from Beilman et al. 2008	1,213	Table S5, Table S6, Vitt et al. 2000
		High	1,650 ¹		--	
	Average oil sands biomass		--	--	78	Table S7 ²
	Average oil sands soil		--	--	438	
Rate of carbon uptake during reclamation (metric tons C/ha/yr)	Forest	Low	--	--	1.35	Table S7; Carrasco et al. 2006; Amiro et al. 2003
		High	--	--	2.25	
	Peatland	Low	--	--	-- ³	--
		High	--	--	-- ³	
Post-mining above-ground biomass stocks (metric tons C/ha)	Reclaimed lands	Low	--		76	See assumptions on p. S13 ⁴
		High	--		90	
Post-mining soil carbon stocks (metric tons C/ha)	Reclaimed soils	Low	50	See p. 5, Cumulative Effects Management Association (2010)	61	See assumptions on p. S13 ⁵
		High	146		101	

Carbon pool	Land type		Rooney et al. 2012		Yeh et al. 2010	
			Value	Source	Value	Source
Carbon stock loss (metric tons C/ha)	Average carbon loss from reclamation of oil sands	Low	--	--	271 ⁶	Calculated from information in Table S7
		High	--	--	411 ⁷	
	Carbon loss from reclamation of peatland to upland forest	Low	384	See p. 5 ⁸	778 ¹⁰	
		High	1,600	See p. 5 ⁹	1,067 ¹¹	
Forgone carbon sequestration (metric tons C/ha/yr)	Forest		--	--	0 ⁴	See Table S7
	Peatland	Low	0.19	Vitt et al. 2000, Turetsky et. al 2002	0.17	See Table S7, Turetsky et. al 2002
		High	0.24		0.24	

Source: Rooney et al. 2012 and Yeh et al. 2010.

Notes:

-- = Not estimated, C/ha/yr = carbon per hectare per year.

¹ Carbon stock depends on peat depth, composition, and bulk density.

² Assumes distribution is 23% peatland and 77% upland forest (see Table 2, note c in Yeh et al. 2010)

³ Yeh et al. (2010) assume that peatland is reclaimed to boreal forest at the rate of boreal forest carbon uptake.

⁴ Yeh et al. (2010, p. S13) assume that reclaimed forest sequesters carbon in aboveground biomass for 80 years at 1.35 to 2.25 metric tons of carbon/ha/yr (30% of this is sequestered in soils), or until aboveground biomass reaches the pre-disturbance level.

⁵ Assumes 30% of carbon is sequestered in soil at a constant rate throughout 150 year modeling period (Yeh et al., 2010, p. S13).

⁶ Calculated from original above and below ground carbon stock for average of oil sands lands, minus post-mining carbon stocks. Based on Table S7, assumes 70% of soil carbon loss, and 84% of biomass carbon loss (Yeh et al. 2010, p. S15).

⁷ Calculated from original above and below ground carbon stock for average of oil sands lands, minus post-mining carbon stocks. Based on Table S7, assumes 90% of soil carbon loss and 100% of biomass carbon loss (Yeh et al. 2010, p. S15).

⁸ Calculated from the original carbon stock, minus the post-mining carbon stock: 4.8 million metric tons carbon loss, divided by 12,414 hectares = 384 metric tons carbon/hectare (Rooney et al. 2012, p. 5).

⁹ Calculated from the original carbon stock, minus the post-mining carbon stock: 19.9 million metric tons carbon loss, divided by 12,414 hectares = 1,600 metric tons carbon/hectare (Rooney et al. 2012, p. 5).

¹⁰ Calculated from original above and below-ground carbon stocks for peatlands, minus post-mining carbon stocks. Based on Table S7, assumes 70% of soil carbon loss, and 84% of biomass carbon loss (Yeh et al. 2010, p. S15).

¹¹ Calculated from original above and below-ground carbon stocks for peatlands, minus post-mining carbon stocks. Based on Table S7, assumes 90% of soil C loss and 100% of biomass C loss (Yeh et al. 2010, p. S15).

¹² Yeh et al. (2010) assume the long-term net carbon accumulation rates (including natural and human disturbances) are zero for all eco-regions except peatlands.

The studies found that the net carbon release is particularly influenced by the disturbance of peatlands for two reasons. First, carbon-rich peatlands disturbed by oil sands mining operations will likely be largely reclaimed to upland forests or marshes and riparian shrublands (Rooney et al. 2012, p. 1; Yeh et al. 2010, p. 8768). The two studies estimate that the carbon stock in peatland is between 1.8 to 5.6 times larger than in boreal forest, although estimates of carbon stock in peatland vary widely, depending on peat depth, composition, and bulk density (Rooney et al. 2012, p. 4). Yeh et al. assume that carbon sequestration in reclaimed forests will occur at an annual rate of 1.35 to 2.25 metric tons of carbon per hectare until the aboveground biomass equals the pre-disturbance level, or for 80 years, whichever condition is met first, and that 30% of the sequestered carbon is stored in the soil at a constant rate for 150 years. Rooney et al. found that soil carbon stocks post-mining are between 50 to 146 metric tons of carbon per hectare—one-third to one-thirtieth of the pre-mining peatland carbon stock (Rooney et al. 2012, p. 5). The estimates of carbon stocks in soils reclaimed from peatland are reasonably consistent in the two

studies: 50 to 146 metric tons carbon per hectare in Rooney et al. (2012), and 61 to 101 metric tons carbon per hectare in Yeh et al. (2010).

Second, unlike mature forests, which Yeh et al. assume have achieved a steady-state of carbon flux, peatlands continue to sequester carbon underground for much longer periods of time. Rooney et al. and Yeh et al. estimate that peatland continues to sequester carbon over the long-term at an annual rate of 0.17 to 0.24 metric tons of carbon per hectare (Rooney et al. 2012, p. 5; Yeh et al. 2010, p. 8768). As peatlands are reclaimed into boreal forests, this impacts the long-term sequestration potential of the land as well as increases short-term emissions from the aboveground storage of peat, which can decay and release both CO₂ and CH₄ (Yeh et al. 2010, pp. 8766-8767).

A full comparison between the studies is not possible, since Rooney et al. (2012) and Yeh et al. (2010) examine different aspects of the carbon impacts of oil sands mining. Rooney et al. (2012) looks at per-hectare and total emissions loss associated with mining peatland only, and does not explicitly separate out aboveground biomass.²² Yeh et al. (2010) looks at average per-hectare emissions from lands mined for oil sands, which they estimate to be 23% peatland and 77% boreal forest. Thus, only peatland results for the two studies are comparable. Peatland soil carbon loss values were within a similar range: 384 – 1,600 metric tons of carbon/year in Rooney et al. (2012) and 778 – 1,067 metric tons of carbon/year in Yeh et al. (2010); the range in Rooney et al. (2012) is larger because they estimated a wide range for the value of peatland soil carbon storage, depending on peat depth, composition, and bulk density. Given this and the difference in accounting for above and below ground carbon stocks in the two approaches, the results are reasonably consistent with each other.

Yeh et al. found that the net contribution of land use change to life-cycle emissions from WCSB oil sands development is relatively small, with the land use GHG emissions amounting to less than 0.4 to 2.5 percent of WTW life-cycle GHG emissions from oil sands production (considering both surface mining and in-situ production) over a 150-year modeling period.^{23,24} In comparison, the authors estimate that land use change accounts for less than 0.4 percent of emissions from conventional crude extraction in California (i.e., less than 0.4 gCO₂e/MJ), and 0.1 to 4 percent of emissions from conventional oil extraction in Alberta (i.e., 0.1 to 3.4 gCO₂e/MJ).

In absolute terms, Rooney et al. found that land use changes for approved oil sands development could release 11.4 to 47.3 million metric tons of carbon (or 68 to 283 metric tons of carbon per hectare) and reduce sequestration by 5,734 to 7,241 metric tons of carbon per year (or 34 to 43 kg of carbon per hectare), though the authors did not compare these releases and losses to life-cycle GHG emissions associated with extraction, upgrading, transportation, refining, and

²² Rooney et al. (2010, p. 4) estimates total initial peatland carbon storage and compares this to carbon storage in post-mining soils; the extent to which aboveground biomass contributes to these estimates is not explicitly provided.

²³ Yeh et al. compare GHG emissions per megajoule of crude refinery feedstock to full life cycle GHGs per megajoule of refined gasoline. The authors acknowledge that these two terms are not exactly equivalent, but they are evaluated as an approximate comparison. Further adjustments for efficiency losses at the refinery and allocation of GHG emissions to other refined products would be necessary for a fully consistent comparison.

²⁴ Yeh et al. also estimate that methane emission from tailings ponds could contribute an additional 0 to 7.91 gCO₂e/MJ of crude refinery feedstock. Together, land use change and tailings pond emissions could contribute up to 11% of overall life cycle emissions.

combustion of refined products from oil sands-derived crudes. According to Jacobs (2012), the GHG emissions from land disturbance estimated in Rooney et al. correspond to 0.5 to 3 gCO₂/MJ of bitumen, and 0.003 gCO₂e/MJ from loss of CO₂ sequestration (Jacobs 2012, p. 5-55).

4.3 DATA QUALITY AND TRANSPARENCY

As discussed in the previous sections, study design factors and assumptions drive the WTW GHG comparisons between oil sand-derived crudes relative to reference crudes. However, the results ultimately hinge on a third key factor: data quality. The quality of the data in the LCAs relates to a number of elements including precision, completeness, representativeness (i.e., time-related, geographical, and technology coverage), consistency, reproducibility, data sources, uncertainty, and documentation of missing data (ISO 14044:2006). The ability to assess data quality is contingent on the level of transparency provided by the study authors.

The quality of the data and transparency in the presentation of the data elements, assumptions, and data gaps varies considerably by study. Representativeness was a key area of concern in some of the studies in that they lacked data on actual facility operations. NRDC (2010) notes that studies used pre-project startup data (e.g., from applications for facilities that are not yet built or operating). According to Pembina (2011), both Jacobs (2009) and TIAX (2009) did not incorporate data from the two largest mining projects. TIAX uses data from six oil sands projects that represent 34 percent of the 2009 total oil sands production capacity in Alberta; two of these projects were not yet producing at the time of the report. Additionally, some studies base individual life-stage emissions on few parameters (e.g., API gravity for refining) (NETL 2008, 2009; ICCT 2010).

Most studies do not provide complete transparency in their methodologies, assumptions, or data sources. This is partially a function of the difficulty in accessing necessary data elements on or from non-transparent international crude production operations. Data on oil sands fields are typically less robust (and include a smaller data set) than those for reference crudes. This impedes the ability to make meaningful results comparisons for oil sands-derived crudes and reference crudes. ICCT (2010) acknowledges the lack of data/transparency for oil sands and in general notes, Where data were missing, Energy-Redefined LLC made estimates based on expert judgment and calculations and calibrated them with known data and available studies for verification, (ICCT 2010, p. 12). Some studies used proprietary models (e.g., a crude production model in Jacobs [2009] and an oil field model in ICCT [2010]), which keep various assumptions and calculations hidden.

Few studies considered uncertainty, and none of them rigorously treat underlying uncertainties in data inputs and models. Pembina (2006) selected point estimates for GHG emissions from different industry sources to present life-cycle stages together—an approach that could risk inconsistent characterization of the processes within the study. Other studies (e.g., IHS CERA 2010, 2011) calculated averages from a wide range of values and developed point estimates without providing bounds on uncertainty. Such bounds are important because a high bound on a reference crude can overlap with a low bound on an oil sands crude.

4.4 ANALYSIS OF KEY FACTORS AND THEIR IMPACT ON WTW GHG EMISSIONS RESULTS

This section analyses the effect that the various key factors described in Sections 4.1, Study Design Factors, and 4.2, Input and Modeling Assumptions, have on the life-cycle GHG emissions of WCSB oil sands crudes compared to reference crudes. To analyze the effects, the key factors and life-cycle results from NETL (2008, 2009) are compared against the other studies. Comparing the factors and results of one study against all other studies identifies the key factors that differ the most, and the magnitude of the impact that they have on life-cycle GHG emissions.

The NETL studies were selected as a basis for comparison against the other studies for several reasons. They cover a range of the world crude oils consumed in the United States, including the WCSB oil sands as well as the average crude consumed in the United States in 2005. The NETL factors have informed other fuel-related policy issues, as they have been used for the baseline in the USEPA Renewable Fuel Standard (RFS2).

4.4.1 Analysis of Study Design Factors

Table 4-11 summarizes key design factors across the studies identified through this assessment. The first row of Table 4-11 qualitatively assesses the impact of including each factor in a WTW analysis into an approximate high/medium/low arrangement based on results from across the studies evaluated. The high impact factors were those found to result in greater than about 3 percent change in WTW emissions across the studies; medium impact indicates an approximate 1 to 3 percent change in WTW emissions, and low impact indicates less than about 1 percent change in WTW emissions. The assignment to high, medium, or low categories is based on ICF analysis and judgment.

Estimated Relative WTW Impact: ¹		High					Medium				Low
Source	Data Reference Year(s)	Petroleum coke combustion ²	Cogeneration credit ³	Upstream production of fuels included ⁴	Flaring/ venting GHG emissions included	Capital equipment included ⁶	Refinery emissions account for upgrading ⁵	Local and indirect land use change included	Methane emissions from tailing ponds included	Fugitive leaks included	Methane emissions from mine face
NETL, 2008	2005	No	NS	Yes	Yes	No	No	No	NS	Yes	NS
NETL, 2009	2005	No	NS	Yes	Yes	No	No	No	NS	NS	NS
IEA, 2010	2005-2009	NS	NS	Yes	NS	NS	NA	No	Yes	NS	NS
IHS CERA, 2010, 2011	~2005-2030	V	V	No	NS	NS	NA	No	V	NS	V
NRDC, 2010	2006-2010	NS ⁷	NS ⁷	P	NS	NS	NA	No	NS	NS	NS
ICCT, 2010	2009	NS	No	P	Yes	No	No	No	NS	Yes	NS
Jacobs, 2009	2000s	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	No
Jacobs, 2012	2000s	Yes	No ⁸	Yes	Yes	No	Yes	Local	Yes	Yes	Yes
TIAX, 2009	2007-2009	P	P	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Charpentier, et al., 2009	1999-2008	NS ⁷	NS ⁷	V	NS	V	NA	No	NS	NS	NS
Brandt, 2011	V	V	V	NS ⁷	V	NS ⁷	V	V	V	V	V
RAND, 2008	2000s	NS	NS	NS	Yes	No	No	No	Yes	Yes	Yes
Pembina Institute, 2005	2000, 2004	NS	NS	NS	P	No	No	No	NS	P	NS
Pembina Institute, 2006	2002-2005	NS	NS	No	P	No	No	No	Yes	Yes	Yes
McCann, 2001	2007	P	NS	Yes	NS	No	NS	No	NS	NS	NS
GHGenius, 2010	Current	Yes	No	Yes	Yes	No	NS	Local	Yes	Yes	Yes
GREET, 2010	Current	NS	NS	Yes	Yes	No	NS	No	NS	Yes	NS
Rooney, et al., 2012	1990s, 2000s	NA	NA	NA	NA	NA	NA	Local	No	NA	NA
Yeh, et al., 2010	2000s	NA	NA	NA	NA	NA	NA	Local	Yes	NA	NA

Notes: Yes = included in life-cycle boundary; No = not included; P = partially included; NS = not stated; NA = not applicable; V = varies by study addressed in meta-study.

¹ High impact = greater than about 3 percent change in WTW emissions. Medium impact = approximately 1 to 3 percent change in WTW emissions. Low impact = less than about 1 percent change in WTW emissions.

² Yes indicates that GHG results for products such as gasoline, diesel, and jet fuel do include petroleum coke production and combustion. No indicates that GHG emissions from petroleum coke production and combustion were not included in the system boundary for gasoline, diesel, or jet fuel. The effect of including petroleum coke depends on how much is assumed to be stored at oil sands facilities versus sold or combusted, and whether a credit is included for coke that offsets coal combustion.

³ Yes indicates that the study applied a credit for electricity exported from cogeneration facilities at oil sands operations that offsets electricity produced by other power generation facilities. No indicates a credit was not applied. Including a credit for oil sands will reduce the GHG emissions from oil sands crudes relative to reference crudes.

⁴ Indicates whether studies included GHG emissions from the production of fuels that are purchased and combusted on-site for process heat and electricity (e.g., natural gas).

⁵ Indicates whether refinery emissions account for the fuel properties of SCO relative to reference crudes. Since SCO is upgraded before refining, it requires less energy and GHG emissions to refine into gasoline, diesel, and jet fuel products.

⁶ Indicates whether the study included GHG emissions from the construction and decommissioning of capital equipment such as buildings, equipment, pipelines, rolling stock.

⁷ Not discussed in the meta-study; may vary by individual studies analyzed.

⁸ Jacobs (2012) did not apply a credit for export of excess electricity generated at SAGD or upgrading facilities. In calculating the carbon intensity of production from SAGD processes using reports to the Alberta Energy Conservation Board for facilities that export electricity, the study calculated the natural gas amount that would be used to produce the excess electricity and subtracted this from total natural gas consumption (Jacobs 2012, p. 5-36).

In general, the studies reviewed are consistent with one another in how they treat some factors. For example, the studies' life-cycle boundaries generally exclude emissions associated with land use changes and capital equipment. As discussed at length in Sections 4.1 and 4.2, Study Design Factors and Input and Modeling Assumptions, the studies vary widely, however, in their treatment of other factors such as their treatment of petroleum coke and exports of cogenerated electricity.

The first two categories in Table 4-11 (i.e., petroleum coke combustion and cogeneration credit) relate to how the studies treat allocation and co-product design factors. The remaining categories compare the completeness of the LCA boundaries of the studies. The data reference years column indicates the time period over which the results of each study are representative. With respect to the first two categories dealing with allocation and co-product design factors:

- The petroleum coke combustion column indicates whether GHG emissions for premium fuel refined products include the emissions from producing and combusting petroleum coke. Treatment of petroleum coke can have a large impact on WTW GHG emissions. For example, IHS CERA (2010) estimated that the inclusion of petroleum coke combustion would increase the combustion emissions from a barrel of refined fuel products by 48 kgCO₂e, or roughly an 8 to 10 percent increase in WTW GHG emissions, depending on the crude type. NETL allocated the emissions from the production and combustion of co-product petroleum coke outside the LCA system boundary (NETL 2008). Across the other studies, a wide variation of approaches account for petroleum coke (see Section 4.2.3.1, Petroleum Coke Treatment, for details).
- The cogeneration credit column shows whether the studies include an electricity cogeneration GHG credit for excess capacity of electricity generation that can be exported for use elsewhere on the electricity grid. As described in Section 4.2.1.4, Electricity Cogeneration and Export, applying a GHG credit for avoided grid-based electricity reduces the WTW GHG emissions for oil sands crudes relative to the range of reference crudes. It is unclear whether NETL assigned electricity cogeneration GHG credit in its study. Jacobs (2009) indicated that including an electricity cogeneration GHG credit for displaced grid-based electricity has the potential to reduce the WTW GHG emissions for oil sands crudes to within the range of reference crudes (Jacobs 2009, p. 1-13). This translates into roughly a 5 to 10 percent reduction in WTW GHG emissions assuming displacement of the local Alberta electricity grid mix, which is mostly coal-based electricity (Jacobs 2009).²⁵

The remaining categories indicate whether several secondary carbon flows are included within the LCA boundaries of the studies (see Figure 2-1 for reference):

- NETL and most other studies include the GHG emissions associated with upstream production of purchased fuels and electricity that is imported to provide process heat and to power machinery throughout crude production. The upstream GHG emissions for natural gas fuel and electricity production used in the production of oil sands are significant. Jacobs (2009, 2012) includes GHG emissions associated with the natural gas and electricity upstream fuel cycle which accounts for roughly 4 to 5 percent of the total WTW GHG

²⁵ The latest Jacobs study (2012) does not apply a cogeneration credit for electricity exports from SAGD and oil sands upgrading facilities (Jacobs 2012, p. 4-18).

emissions for average WCSB oil sands. IHS CERA (2010) indicates that although their study excludes upstream fuel and electricity GHG emissions, the inclusion of the upstream GHG emissions would add 3 percent to WTW emissions on a per-barrel-of-refined-products basis.

- Emissions associated with flaring and venting are a high impact source of GHG emissions included in the NETL study. The TIAX 2009 study indicates that including venting and flaring emissions associated with oil sands production (particularly for mining extraction techniques) contributes up to 4 percent of total WTW GHG emissions. Flaring and venting emissions are included in several other studies; however, a few studies reviewed did not explicitly state whether they were included.
- Only a few studies modeled the effect that upgrading SCO has on downstream GHG emissions at the refinery. Jacobs (2009) and TIAX (2009) include this effect and determine that the GHG impact of upgrading bitumen into SCO will reduce the emissions at the refinery. Compared to refining bitumen directly, refining SCO (which already has been upgraded) would reduce WTW GHG emissions by between 1 and 2 percent.²⁶
- None of the studies included the GHG impacts associated with capital equipment and construction of facilities, machinery, and infrastructure needed to produce oil sands. According to Bergerson and Keith, the relative percentage increase to WTW GHG emissions from incorporating capital equipment is between 9 and 11 percent (Bergerson and Keith 2006). Charpentier et al. discuss the need to more fully investigate and include these potentially significant supply chain infrastructure GHG emissions in future oil sands life-cycle studies (Charpentier et al. 2009, p. 10).
- During oil sands production, local and indirect land use change emissions associated with changes in biological carbon stocks from the removal of vegetation, trees, and soil during oil sands mining operations may be significant. Except Jacobs (2012) and GHGenius, none of the other life-cycle studies reviewed included land use change GHG emissions in the WTW life-cycle assessment. Studies describing the potential GHG emissions impacts of including land use change emissions estimate potential increases in WTW GHG emissions for oil sands range from less than 1 to 3 percent (Yeh et al. 2010). To the extent that land is reclaimed after oil sands operations are completed, this lost carbon would be returned over a long time period and may stabilize at lower levels than pre-mining conditions. Rooney et al. found that, under current mining reclamation plans, carbon-rich peatlands disturbed by oil sands mining operations will be largely reclaimed to upland forests or marshes and riparian shrublands. Soil carbon stocks post-mining are between 50 to 146 metric tons of carbon per hectare—one-third to one-thirtieth of the pre-mining peatland carbon stock, depending on the original peat depth, composition, and bulk density (Rooney et al. 2012, p. 5).

²⁶ Due to the complexity of refining processes, it is difficult to estimate the magnitude of this effect. Comparing refining emissions from TIAX (2009) and Jacobs (2009)—which accounted for the fact that upgraded SCO will require less energy to refine into premium products—to refining emissions from GHGenius and NETL—which did not account for this affect—showed a 1 to 2 percent reduction in WTW GHG emissions, on average, across the studies. Comparing individual studies, the minimum change was 0.4 percent and the maximum was 4.1 percent. These changes may not be entirely attributable to accounting for upgraded SCO at the refinery, but they represent a rough, upper-bound estimate. Refining values for TIAX, Jacobs, GHGenius, and GREET were taken from Brandt (Brandt 2011, Table 8, p. 45).

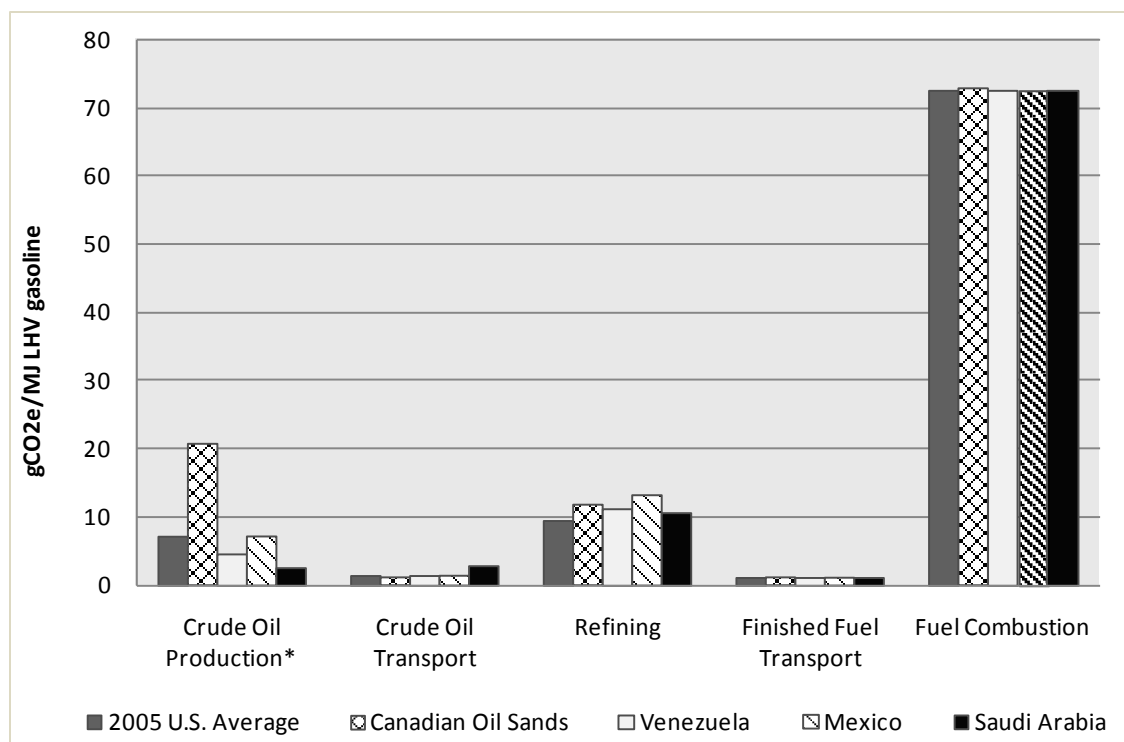
- Methane emissions from fugitive leaks, oil sands mining operations, and tailings ponds are not included across all studies. Jacobs (2012), TIAX (2009), Pembina (2006), and GHGenius include the impacts of both sources. Fugitive emissions from leaks throughout the oil sands production process can potentially contribute up to 1 percent of WTW GHG emissions according to emissions estimates from Environment Canada's National Inventory Report (Environment Canada 2010). Emissions from oil sands mining and tailings ponds potentially have a larger impact on WTW GHG emissions, contributing 0 to 9 percent of total WTW GHG emissions (Yeh et al. 2010). IHS CERA excludes emissions from methane released from tailings ponds but recognizes there is considerable uncertainty and variance in quantifying these emissions (IHS CERA 2010, p. 15).
- Methane emissions from the mine face of oil sands mining operations are in the low-impact category. Only the Jacobs (2012), Pembina (2006), RAND (2008), and GHGenius sources recognize and include this emissions source, although many studies did not explicitly state whether these emissions were included or not considered. Methane emissions from the mine face are estimated to contribute less than 1 percent of total WTW GHG emissions (Pembina 2006, p. 11).

4.4.2 Analysis of Input and Modeling Assumptions

This section assesses several key input assumptions that influence the life-cycle GHG results provided by NETL (2008, 2009). Figure 4-5 summarizes GHG emissions for each of the reference crudes and average WCSB oil sands crude across the different life-cycle stages as quantified in the NETL studies.

NETL provides a single WCSB oil sands (i.e., Canadian Oil Sands) estimate that represents a weighted average of 43 percent crude bitumen from in situ production and 57 percent SCO from mining (NETL 2009). The NETL study did not account for the fact that condensate is blended with crude bitumen to form dilbit, which is transported via pipeline to U.S. refineries. Since condensate has a lower GHG intensity than crude bitumen, per-barrel GHG emissions from dilbit are less than per-barrel emissions from crude bitumen. Note that in the NETL studies the upgrading stage for WCSB oil sands is included in the crude oil production stage. The GHG emissions from the crude oil production stage for WCSB oil sands are more than double the GHG emissions compared to the range of crude oil production for the reference crudes.

Figure 4-5 also shows that the transport stages (both the crude oil transport upstream and the finished fuel transport downstream) collectively account for a small minority (2 to 4 percent) of the total WTW GHG emissions across all reference crudes and WCSB oil sands. Finally, the fuel combustion stage (i.e., TTW) component of the WTW fuel life-cycle GHG emissions for all reference crudes and oil sands are identical and account for the majority (70 to 80 percent) of the total WTW GHG emissions.



Source: All values from NETL 2009.

Note: GHG emissions are presented in grams CO₂ equivalent per megajoule of gasoline on a lower heating value (LHV) basis.

* Includes upgrading for WCSB oil sands.

Figure 4-5 WTW GHG emissions across the fuel life-cycle for WCSB oil sands average crude (i.e., Canadian Oil Sands) and reference crudes

Table 4-12 summarizes the life-cycle GHG emissions for gasoline produced from oil sands-derived crude relative to other reference crudes consumed in the United States (NETL 2009).

Table 4-12 GHG Emissions for Producing Gasoline from Different Crude Sources from NETL 2009 and Estimates of the Impact of Key Assumptions on the Differential between Oil Sands and U.S. Average Crude

Life-Cycle Stage	GHG Emissions (gCO ₂ e/MJ LHV gasoline) ^a					Findings on Key Assumptions Influencing Results	
	2005 U.S. Average	Canadian Oil Sands	Venezuela	Mexico	Saudi Arabia	Description	Estimated Ref Crude WTW Impact ^b
Crude Oil Extraction	6.9	20.4 ^c	4.5	7.0	2.5	Oil sands estimate assumes a weighted average of 43% crude bitumen not accounting for blending with diluent to form dilbit) from CSS in situ production and	NA
Upgrading	NA	IE	NA	NA	NA		

Life-Cycle Stage	GHG Emissions (gCO ₂ e/MJ LHV gasoline) ^a					Findings on Key Assumptions Influencing Results	
	2005 U.S. Average	Canadian Oil Sands	Venezuela	Mexico	Saudi Arabia	Description	Estimated Ref Crude WTW Impact ^b
						57% SCO from mining, based on data from 2005 and 2006	
Crude Oil Transport	1.4	0.9	1.2	1.1	2.8	Relative distances vary by study	Low increase or decrease
Refining	9.3	11.5 ^d	11.0	12.9	10.4	Did not evaluate impact of upgrading SCO prior to refinery; only affects oil sands crudes.	Medium decrease
Finished Fuel Transport	1.0	0.9	0.9	0.9	0.9	Transportation excluded co-product distribution	Low increase
Total WTT	18.6	33.7	17.6	22.0	16.7		
Fuel Combustion	72.6	72.6	72.6	72.6	72.6		
Total WTW	91.2	106.3	90.2	94.6	89.3	All crudes other than Canadian oil sands when petroleum coke is accounted in U.S. Gulf Coast refineries	High increase
Difference from 2005 U.S. Average	0%	17%	-1%	4%	-2%		

Notes: CSS = carbon capture and storage, gCO₂e/MJ = grams carbon dioxide equivalent per megajoule, GHG = greenhouse gas, IE = Included elsewhere; NA = Not applicable; LHV = Lower heating value; SCO = synthetic crude oil, WTT = Well-to-tank; WTW = Well-to-wheels.

^aNETL 2009 values converted from kgCO₂e/MMBtu using conversion factors of 1,055 MJ/MMBtu and 1000 g/kg.

^bEstimated impact on the WTW GHG emissions for reference crudes, except where noted (i.e., refining assumption affects oil sands crudes), as result of addressing the key assumptions/ missing emission sources. High = greater than approximately 3 percentage points change, Medium = approximately 1 to 3 percentage points change, and Low = less than approximately 1 percentage point change in WTW emissions.

^cIncluded within extraction and processing emissions.

^dCalculated by subtracting other process numbers from WTT total; report missing this data point.

^eThe effect that including petroleum coke manufacture, transportation, and combustion has on WTW results depends on assumptions about the replacement of petroleum coke supply from Gulf Coast refineries in its market by coal or fuel oil.

The results from the NETL study are subject to several input assumptions that influence the analysis results. These assumptions, and their estimated scale of impact on the WTW results, are presented below and are summarized in the last two columns of Table 4-12.

- First, NETL (2009) developed its weighted-average GHG emission estimate for oil sands extraction (including upgrading) from data on mining and CCS in situ operations in 2005 and 2006. The estimate that the NETL study used for mining oil sands was based on a 2005 industry report that estimates higher values than more recent estimates of surface mining GHG emissions (TIAX 2009; Jacobs 2009, 2012). The in situ GHG estimate is based on a CSS operation which, while CSS operations tend to be more GHG intensive than SAGD processes, is generally in the range of in situ estimates in other studies (e.g., TIAX 2009, Jacobs 2009). The NETL study, however, did not account for the fact that natural gas

condensate is blended with crude bitumen to form dilbit, which is transported via pipeline to the United States. Since condensate has a lower GHG intensity than crude bitumen, per-barrel GHG emissions from dilbit are less than per-barrel emissions from crude bitumen.

- Second, NETL allocated refinery emissions from co-products other than gasoline, diesel, and jet fuel to the co-products themselves, including petroleum coke and only considered combustion emissions from gasoline, diesel, and kerosene-type jet fuel (NETL 2009, p. 72). This approach removes the GHG emissions associated with producing and combusting co-products from the study's life-cycle boundary. This was consistent with NETL's goal of estimating the contribution of crude oil sources to the 2005 baseline GHG emissions profile for three transportation fuels (gasoline, diesel, and kerosene-type jet fuel). As discussed in Section 4.2.3.1, Petroleum Coke Treatment, including the GHG emissions from the production and combustion of petroleum coke significantly increases WTW GHG emissions for crudes where the petroleum coke is combusted. If petroleum coke produced from refineries is assumed to supplement coal combustion, however, the net emissions from coke combustion will be much smaller. As a result, the effect of including petroleum coke combustion depends on study assumptions about the end use of petroleum coke at both the refinery and upgrader, and whether the elimination of petroleum coke manufacture when SCO is refined is offset by the crude oil displaced by WCSB crude or by additional coal production. The energy demand in the market supplied by petroleum coke does not change.
- Third, the NETL study used linear relationships to relate GHG emissions from refining operations to specific crudes based on API gravity and sulfur content. The study notes that these relationships do not account for the fact that bitumen blends and SCO in particular will produce different fractions of residuum and light ends than full-range crudes. Accounting for this effect in the refinery will change the differences between WTW GHG emissions from WCSB oil sands-derived premium fuels.
- Fourth, as noted in Table 4-12 and described in Section 4.4.1, Analysis of Study Design Factors, the NETL study did not fully evaluate the impact of pre-refining SCO at the upgrader prior to the refining stage and is potentially overstating the emissions associated with refining oil sands. Upgraded bitumen in the form of SCO would require less refining and GHG emissions would decrease by roughly 1 to 2 percentage points relative to other reference crudes.
- Finally, since the transport stages of the fuel life cycle (both upstream crude oil transport and downstream finished fuel transport) account for minor portions (1 to 3 percent and 1 percent, respectively) of the overall WTW GHG emissions across the reference crudes and oil sands, the impact of transportation distance assumptions on total WTW GHG emissions are small. For example, in the finished fuel transport stage, emissions associated with crude co-product distribution are excluded and would increase relative transport GHG emissions by approximately 0.2 to 0.3 percentage points if included.²⁷ Note also in the NETL comparisons

²⁷ All crude oils with exception of SCO have a vacuum residuum content, which is processed in the Gulf Coast refineries to G+D (gasoline plus diesel) and petroleum coke. Nearly all U.S. petroleum coke manufactured in southeast Texas is exported to China, India, and other foreign locations. ICF evaluated the effect of including petroleum coke transport to Asia, assuming that the voyage is roughly equivalent to ocean transport of crude oil from Saudi Arabia to the Gulf of Mexico, and adjusting transport GHG emissions by the fraction of crude that is converted to petroleum coke.

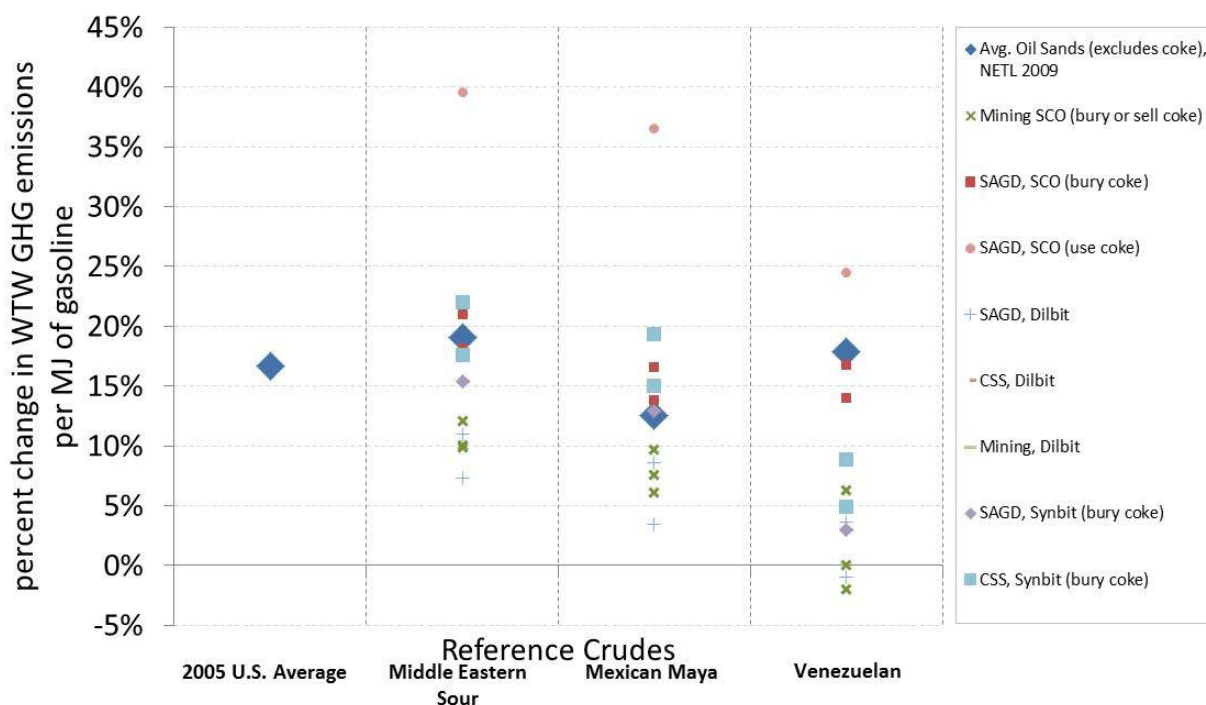
in Figure 4-5 that Mexican Maya and Venezuelan crude transport are shown to be equal, at about half the value of Saudi Arabia crudes. However, the transport distance of Mexican crude to Southeast Texas is less than half that of Venezuelan crude, and 7 percent of the distance of Saudi crudes. This differential would be compounded on a GHG emissions per barrel of premium fuel product basis as Mexican and Venezuelan heavy crudes produce less premium fuel per barrel transported than Saudi crudes.

4.4.3 Summary Comparison of Life-Cycle GHG Emission Results

Figure 4-6 and Figure 4-7 compare, respectively, the WTW and WTT GHG emissions of gasoline produced from WCSB oil sands crudes relative to four reference crudes based on data from the studies included in this assessment. These figures were developed from an extensive review of the design and input assumptions of the life-cycle studies in the scope of this assessment.

The results in Figure 4-6 and Figure 4-7 are plotted as the percentage change in WTW and WTT GHG emissions from gasoline derived from WCSB oil sands relative to gasoline from the four reference crudes. The large diamonds indicate the NETL results for gasoline produced from the average mix of WCSB oil sands imported to the United States in 2005. The other symbols illustrate the range of GHG emissions estimates across the studies for different oil sands production methods and scenarios.

Apart from the NETL results in Figure 4-6 and Figure 4-7 (which are indicated by large diamonds), each symbol corresponds to a specific method of producing WCSB oil sands crude (e.g., producing SCO from mining, dilbit from SAGD). For SCO and synbit, the symbols also indicate the treatment of petroleum coke produced at the upgrader. For example, the studies assumed that petroleum coke is either: (i) used (i.e., combusted or gasified) for process energy or hydrogen, (ii) stockpiled or buried, or (iii) sold as a co-product.



Sources: Data from NETL 2009, Jacobs 2009, TIAX 2009.

Notes: The percent differentials are calculated using the oil sands results relative to the corresponding study's reference crude. Only NETL (2008, 2009) provided a value for the 2005 U.S. average reference crude. A positive percentage indicates the oil sands' WTW is greater than the X-axis reference chart.

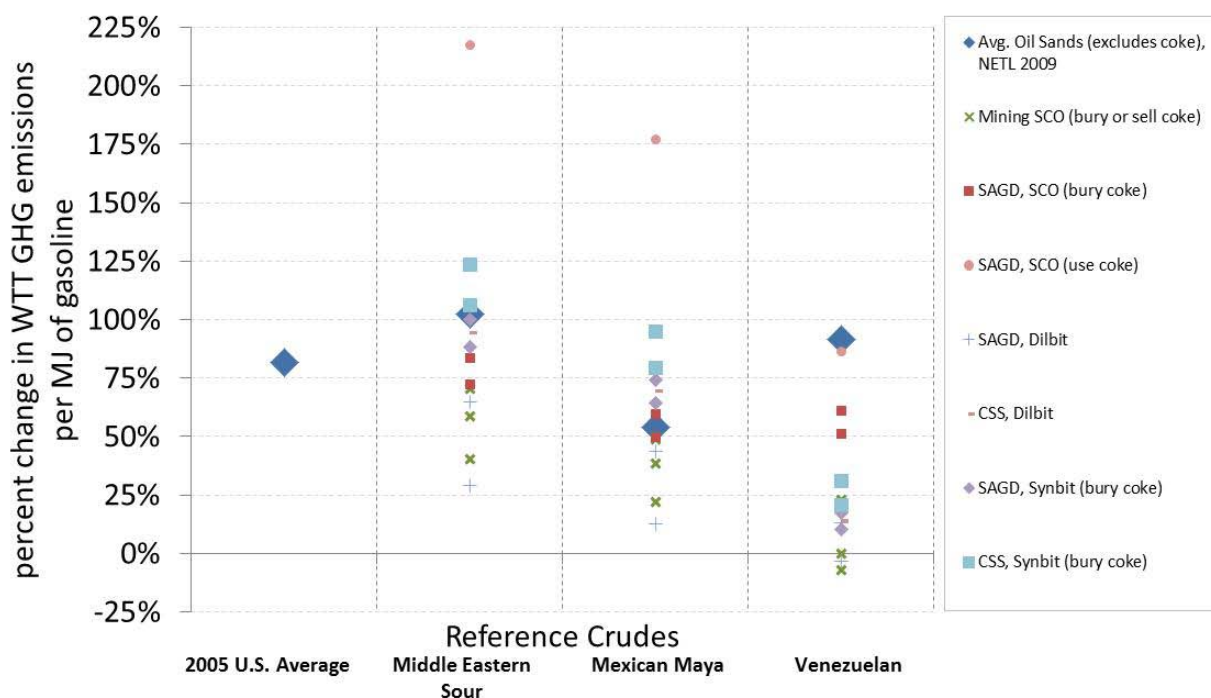
In this chart, all emissions are given per megajoule of reformulated gasoline with the exception of NETL 2009, which is given per megajoule of conventional gasoline.

Venezuela Conventional is used as the NETL reference crude for Venezuela Bachaquero in this analysis. This is a medium crude, not a heavy crude; thus, the NETL values are compared against a lighter Venezuelan reference crude than other studies.

*Dilbit fuels do not include emissions associated with recirculating diluents back to Alberta. TIAX (2009) did not consider recirculation of diluent back to Alberta. Jacobs (2009) evaluated a scenario where diluent is recirculated to Alberta, which increased WTW emissions by 7 gCO₂/MJ (LHV), or 7 percent, for reformulated gasoline relative to the case where diluent is not recirculated. This scenario has not been included in this figure because diluent will not be recirculated by the proposed Project.

CSS = cyclic steam stimulation, GHG = greenhouse gas, MJ = megajoule, SAGD = steam-assisted gravity drainage, SCO = synthetic crude oil, WTW = well-to-wheels.

Figure 4-6 Comparison of the percent differential for various WTW GHGs from gasoline produced from WCSB oil sands relative to reference crudes



Sources: Data from NETL 2009, Jacobs 2009, TIAX 2009.

Notes: The percent differentials are calculated using the oil sands results relative to the corresponding study's reference crude. Only NETL (2008, 2009) provided a value for the 2005 U.S. average reference crude. A positive percentage indicates the oil sands' WTW is greater than the X-axis reference crude.

In this chart, all emissions are given per megajoule of reformulated gasoline with the exception of NETL 2009, which is given per megajoule of conventional gasoline.

Venezuela Conventional is used as the NETL reference crude for Venezuela Bachaquero in this analysis. This is a medium crude, not a heavy crude; thus, the NETL values are compared against a lighter Venezuelan reference crude than other studies.

*Dilbit fuels do not include emissions associated with recirculating diluents back to Alberta. TIAX (2009) did not consider recirculation of diluent back to Alberta. Jacobs (2009) evaluated a scenario where diluent is recirculated to Alberta, which increased WTW emissions by 7 gCO₂/MJ (LHV), or 7 percent, for reformulated gasoline relative to the case where diluent is not recirculated. This scenario has not been included in this figure because diluent will not be recirculated by the proposed Project.

CSS = cyclic steam stimulation, GHG = greenhouse gas, MJ = megajoule, SAGD = steam-assisted gravity drainage, SCO = synthetic crude oil, WTT = well-to-tank.

Figure 4-7 Comparison of the percent differential for various WTT GHGs from gasoline produced from WCSB oil sands relative to reference crudes

Symbols that repeat in the comparison to each reference crude indicate that there are varying differentials even for the same scenario based on different studies (e.g., SAGD, SCO (bury coke)). The percentage differences across the oil sands are a result of (i) differences in technologies and practices utilized to produce the oil sands-derived gasoline including in situ SAGD, in situ CSS, or mining; (ii) differences in the pathway for refining the extracted bitumen (i.e., whether the bitumen was upgraded to SCO, refined as dilbit, refined as synbit, or refined as bitumen directly); and (iii) differences in individual life-cycle studies' design factors and input assumptions. These three factors drive a wide range in results for the overall WTW and WTT comparisons shown in Figure 4-6 and Figure 4-7.

Figure 4-6 and Figure 4-7 show that WCSB oil sands-derived gasoline WTW and WTT GHG emissions differentials are larger than gasoline produced from the four reference crudes. Two data points—SCO from mining where the coke is buried, and dilbit from SAGD—estimate that life-cycle GHG emissions from WCSB oil sands are lower than the Venezuelan Bachaquero reference crude assumed in the studies from which the data were drawn.

More specifically, as shown in Figure 4-6, the NETL results show that the WTW GHG emissions from gasoline produced from WCSB oil sands crude are as much as 17 percent higher than gasoline from the average mix of crudes consumed in the United States in 2005. Gasoline from certain WCSB oil sands crude production schemes emits a maximum of 19, 13, and 16 percent more life-cycle GHG emissions than Middle Eastern Sour, Mexican Heavy (i.e., Mexican Maya), and Venezuelan Bachaquero crudes, respectively.

Figure 4-6 also illustrates that on a WTW basis, gasoline produced from SCO via in situ methods of oil sands extraction (i.e., SAGD and CSS) in general has higher life-cycle GHG emissions than mining extraction methods. This difference is primarily attributable to the energy requirements of producing steam as part of the in situ extraction process.

Gasoline produced from dilbit generally has lower GHG emissions per barrel of crude delivered to the refinery than mining and in situ methods. This is a result of blending raw bitumen with a diluent condensate for transport via pipeline. This analysis evaluates the refining of both bitumen and diluent at the refinery, since diluent will not be recirculated by the proposed Project. GHG emissions per barrel of crude from synbit are similar to mining and in situ SCO.

In Figure 4-7, the same trends are illustrated from the WTT perspective. The percentage increase in WTT GHG emissions shown in Figure 4-7 compared to gasoline produced from reference crudes is much larger than the percentages found in the WTW perspective used in Figure 4-6. This is because the majority of WTW emissions occurs during the combustion stage (i.e., between 70 to 80 percent) and is generally identical irrespective of the feedstock (i.e., reference crude or oil sands) as shown in Figure 4-5 above. Therefore, the WTT perspective dramatically increases the GHG emissions differential between different crudes because the percentage differences are calculated using the same numerator as in the WTW calculations, but with a much smaller denominator.

The GHG emissions across different oil sands extraction, processing, and transportation methods vary by roughly 25 percent on a WTW basis. Life-cycle GHG emissions of fuels produced from oil sands crudes are higher than fuels produced from lighter crude oils, such as Middle Eastern Sour crudes and the 2005 U.S. average mix. Compared to heavier crudes from Mexico and Venezuela crudes, WTW emissions from oil sands crudes range from a maximum 37 percent increase for SAGD SCO involving burning the coke at the upgrader to a 2 percent decrease for mining SCO and burying or selling the coke.

Estimates from recent life-cycle studies are within these ranges: a recent study by IHS CERA, found that transportation fuels produced from oil sands result in average WTW GHG emissions that are 14 percent higher than the average crude refined in the United States (results range from 5 to 23 percent higher) (IHS CERA 2012). In addition, Jacobs found that WTW GHG intensities of transportation fuels produced from oil sands are within 7% to 12% of the upper range of the WTW intensity of conventional crudes (Jacobs 2012).

5.0 PETROLEUM COKE CHARACTERISTICS, GHG EMISSIONS, AND MARKET EFFECTS

The Final EIS, released in August 2011, found that the treatment of petroleum coke in life-cycle studies was an important factor that influences the life-cycle GHG emission results. It is important when comparing oil sands and the reference crudes that the full life cycle be evaluated, not just the upstream or refining stage. The issue of petroleum coke is not a standalone issue for oil sands crudes, it is also a life-cycle consideration for the heavy conventional crudes. If the GHG emissions from producing and combusting petroleum coke and other co-products are included within life-cycle boundaries for one type of crude, it must be done for the other crudes for an even comparison.

Producing a barrel of premium fuels (i.e., gasoline, diesel, and kerosene/jet fuel) from bitumen produces roughly the same amount of petroleum coke as a barrel of premium fuels refined from heavy crudes, such as Venezuelan Bachaquero or Mexican Maya. The actual net GHG emissions from petroleum coke, however, depend on the final end use of the petroleum coke (i.e., whether it is stockpiled or combusted) and how its end use affects demand for other fuels such as coal. Since a portion of the petroleum coke produced from upgrading WCSB oil sands bitumen is currently stockpiled and not combusted, whereas the petroleum coke produced from refining reference crudes at Gulf Coast refineries is combusted, GHG emissions from petroleum coke produced from WCSB oil sands crudes are slightly lower than petroleum coke GHG emissions from other heavy reference crudes.

Recent reports published since the Final EIS (Oil Change International 2013; Gordon 2012) have also recognized petroleum coke as an important source of GHG emissions in the crude oil life cycle. To better understand the importance of petroleum coke in the life cycle of both oil sands-derived and reference crudes, this section describes:

- The characteristics of petroleum coke relative to coal, for which it serves as a substitute in the electric power sector;
- The effect of including petroleum coke production and combustion in life-cycle GHG emission estimates of oil sands and other reference crudes; and,
- A discussion of market effects related to changes in of petroleum coke production, how these effects have been captured in existing LCA studies, likely markets for petroleum coke, and potential effects on the demand for other fuels.

Physical characteristics of petroleum coke are provided in Table 5-1, including heating value (on a higher heating value basis), carbon content, and CO₂ emissions per unit energy. For comparison, these characteristics are also provided for bituminous, sub-bituminous, lignite and anthracite types of coal. The change in CO₂-intensity for these coals is provided relative to petroleum coke on an energy basis. Table 5-1 shows that bituminous, sub-bituminous, and lignite coal are between about 4 and 9 percent less CO₂-intensive than petroleum coke on an energy basis, while anthracite coal is approximately 2 percent more CO₂-intensive.

Table 5-1 Petroleum coke and coal heating values, carbon contents, and CO₂ emissions per unit energy from EPA (2012)

Characteristic	Units	Petroleum coke	Bituminous coal	Sub-bituminous coal	Lignite coal	Anthracite coal
Heating value ^a	e.g., million Btu / short ton	30.12 ^b	23.89 ^c	17.14 ^c	12.87 ^c	22.57 ^c
Carbon content ^d	e.g., % carbon, by weight	92%	67%	50%	38%	70%
CO ₂ emissions per unit energy	kgCO ₂ / million Btu	102.10 ^e	93.27 ^f	97.17 ^f	97.67 ^f	103.67 ^f
	e.g., grams CO ₂ / MJ	96.77	88.40	92.10	92.57	98.26
Change in emissions-intensity relative to petroleum coke	% change	--	-9%	-5%	-4%	2%

Notes: Data in table reflects national characteristics provided by EPA (2012) U.S. Inventory of Greenhouse Gas Emissions: 1990-2010. Original sources cited in EPA (2012) are provided below.

a On a higher heating value basis.

b EIA (2010). Annual Energy Review 2009. U.S. Energy Information Administration.

c EIA (1993). State Energy Report 1992. U.S. Energy Information Administration.

d Calculated from heating value and CO₂ emissions per unit energy.

e Based on data sourced from EIA (1994), EIA(2009), EPA (2009) and EPA (2010b).

f Calculated from USGS (1998) and PSU (2010); data presented in EPA (2010c).

CO₂ = carbon dioxide, kg = kilogram, MJ = megajoule.

Recent reports (Oil Change International 2013; Gordon 2012) have critiqued existing LCA studies for allocating GHG emissions from producing and combusting petroleum coke outside the study boundaries, or for assuming that petroleum coke combustion substitutes or offsets the combustion of coal. Defined pathways for individual products are the cornerstone of LCA, and must be appropriate to the goal and scope of the study. For example, NETL excluded GHG emissions from petroleum coke production and combustion because they are outside the boundary of premium fuel products (i.e., gasoline, diesel, and kerosene/jet fuel) (NETL 2008, 2009). This approach is consistent with the study's goal of estimating the contribution of crude oil sources to the 2005 baseline emissions profile for premium fuels.

Other life-cycle studies do not exclude the GHG emissions from the production and combustion of petroleum coke and other co-products that leave the system boundary. Instead, these studies typically apply a substitution credit for the fuels that are offset in other markets by the use of petroleum coke and other co-products. To calculate the credit, studies generally assume one-to-one substitution on an energy basis (i.e., one Btu of coal is offset by one Btu of petroleum coke). Although some studies have assumed that the net GHG emissions from offsetting coal for coke are negligible, other studies have accounted for the fact that petroleum coke has a higher CO₂ intensity on an energy basis when compared to bituminous and sub-bituminous coal. For example, Jacobs (2009) found this net difference to be approximately 8 gCO₂/MJ (plus a small, unspecified adjustment to account for transportation of coke versus coal) (p. 8-3); the most recent Jacobs report (Jacobs 2012, p. 9-12) assumed that offsetting coal combustion with petroleum coke results in a small incremental net increase of approximately 2 gCO₂/MJ.

Since the treatment of petroleum coke and other co-products has a large effect on WTW GHG emissions, it is important to ensure that consistent system boundaries are applied when comparing GHG emissions from WCSB oil sands crudes to other reference crudes. For example, the GHG emissions from oil sands extraction and upgrading have been estimated as 3.2 to 4.5 times higher than conventional oil production (Oil Change International 2013; Huot 2011), but this comparison does not describe entirely equivalent crude oil types. The upstream LCA stage for oil sands includes the process of upgrading, which removes the heavy coke bottom of the crude barrel. For conventional crudes, the extraction stage does not contain the equivalent process of upgrading or coking; instead, for conventional crudes the coking process occurs within the refining stage.

Since the boundaries across different LCA studies differ depending on the goal and scope of a particular study, the change in WTW emissions from oil sands crudes relative to other reference crudes are compared on an internally-consistent basis (i.e., by comparing the relative change within studies, not across different studies) in Figures 4-6, 4-7, and 6-1, and in Section 6.

Virtually all crude oils, light, medium, and heavy, including bitumen, contain a fraction of the raw oil out of the ground that does not boil even under full vacuum conditions. This fraction, called vacuum residuum will thermally destruct into lower molecular weight hydrocarbon compounds and elemental carbon when heated above about 800°F. This fraction is commonly used for three products: asphalt, residual fuel oil (called No. 6 fuel oil or bunker fuel) and petroleum coke production. The coking process takes advantage of the thermal destruction nature of vacuum residuum by heating the oil above the thermal destruction temperature and quickly discharging the hot oil into a drum where the hydrocarbons exit the top as vapors and the elemental carbon settles to the bottom as petroleum coke.

Canadian oil sands bitumen contains about 40 percent vacuum residuum fraction. When this bitumen is blended with 30 percent diluent, creating what is referred to as dilbit, the dilbit contains about 30 percent vacuum residuum fraction. Venezuelan Bachaquero crude contains about 40 percent vacuum residuum, and Arab Light crude contains about 20 percent vacuum residuum. So the vacuum residuum of Canadian oil sands bitumen is within the range of crude oils commonly refined in the Gulf Coast which is the proposed destination of Canadian oil sands crudes.

Domestic petroleum coke consumption in the United States is unlikely to significantly increase, so petroleum coke exports are likely to continue, with China remaining a large importer of U.S. petroleum coke to meet its domestic energy demands. Since the U.S. EPA specified sulfur limits on No. 6 fuel oil (which are very hard and expensive to achieve in anything but low sulfur crude oils), the U.S. electrical power industry largely abandoned use of No. 6 fuel oil for electricity generation. This limitation of sulfur in fuel oil did not solve the acid rain air pollution problem in the Northeastern United States, so the U.S. EPA specified SO_x emissions controls on coal-fired power plants. Flue gas stack scrubbers remove the SO_x, and hence, the acid rain problem is largely resolved today. Nevertheless, No. 6 fuel oil has not re-entered the power generation market because refineries have installed coking units to convert No. 6 fuel oil into petroleum coke.

While coke can be used as a supplement to coal in electrical power plants, with declining reliance on coal and long term contracts with coal suppliers, petroleum coke has not significantly penetrated the U.S. power plant industry. For example, in 2011, petroleum coke consumption

was equivalent to 0.5 percent of coal consumption for electricity generation across all sectors (EIA 2012a). Most of the Gulf Coast coke is exported to markets in China, Japan, and Mexico, which accounted for 35 percent of all exports in 2011 (EIA 2012b). China was the single largest importer of U.S. petroleum coke, accounting for approximately 14 percent of U.S. exports (EIA 2012b).

The sulfur content of petroleum coke in the United States is a consideration for coal-fired power plants as they must control SO_x emissions with flue gas scrubbers. Consideration is also given to the sulfur content of No. 6 fuel oil, but the power industry is converting to plentiful and inexpensive natural gas, and the coking assets are in place to process virtually all vacuum residuum that is not destined to the asphalt market.

The proposed Project will transport an approximate 50/50 mix of SCO and dilbit. Petroleum coke from the bitumen upgraded into SCO is produced at Canadian upgraders. A significant portion of this petroleum coke—approximately 50 to 75 percent (ERCB 2010; Oil Change International 2013, citing Alberta ERCB)—is currently stockpiled because it faces the same barriers to penetrate the Canadian coal-fired power plant market as does petroleum coke in the United States; it cannot be economically transported by rail for export to overseas markets.

The dilbit half of the proposed Project's throughput would be transported to Gulf Coast refineries where it would produce approximately the same quantities of petroleum coke as other heavy reference crudes such as Venezuelan Bachaquero and Mexican Maya. So of the proposed Project's total WCSB oil sands throughput, slightly more than half the petroleum coke is produced in Canada, where approximately 50 to 75 percent of it is currently stockpiled and the rest substituted for other fuels in the production and upgrader process. The rest of the petroleum coke (all that is produced from the dilbit fraction and none in the SCO) is produced at Gulf Coast refineries where it is used as a fuel in domestic or overseas markets.

Petroleum refineries attempt to maximize the use of all assets. So Gulf Coast refineries will choose blends of Canadian oil sands crudes (dilbit, SCO, synbit) with other domestic and imported crudes to fill out the refinery assets including the coker units. Hence, approximately the same quantity of petroleum coke would be produced from a mix of crudes that backs out imported crude oils such as Mexican Maya, Venezuelan Bachequero, and Saudi Arabian Light crudes. The coke produced from Canadian oil sands crudes would be marketed the same as current coke: most of it would be exported, with China being a large importer of U.S. petroleum coke.

The petroleum coke-associated GHG emissions from oil sands should fundamentally be similar to some heavy reference crudes given the following:

- Accounting for the non-combustion for perhaps half the upgrader petroleum coke manufacture;
- The combustion of coke manufactured from reference crude oils (including transportation to the China market);
- The lower refining emissions of SCO (because all the residuum processing was done at the upgrader); and
- The likely transportation of displaced reference crudes to alternative markets (e.g. Mexican Maya transported 10,000 miles to China rather than 700 miles to the Gulf Coast).

The oil sands petroleum coke-associated GHG emissions will likely be higher than the U.S. average barrel especially with rapidly expanding shale oil production in North America.

While certain LCA studies developed detailed data models of oil sands production, processing, transport and refining processes, including petroleum coke, they do not have access to the detailed data of the processes used to produce other reference crudes. For example, all conventional crudes, such as Saudi Arab Light and most of U.S. production prior to the shale oil boom are in various stages of declining production, requiring enhanced production techniques with larger energy intensities per barrel of oil produced. As a result, the conventional crude production carbon intensity can be expected to trend upward, whereas the WCSB oil sands carbon intensity can be expected to be relatively flat since the deposits are shallow, they can be extracted using mining or near-surface in situ methods, and new production methods could potentially reduce the energy intensity. Even Saudi Arab Light crude from the giant Ghawar field in Saudi Arabia, which is produced with a 10-million barrel per day water flood pumped from the Arabian Gulf, is rapidly increasing in water cut, such that in 10 years it is possible that oil sands will be less energy intensive, well to wheels, than Saudi Arab Light delivered to the same Gulf Coast destination. A large share of Gulf Coast petroleum coke is shipped to China because:

- It is less expensive, including the shipping, than China's coal; and
- China is struggling to keep pace with its rapidly growing economy with equally rapid coal production growth.

Coal accounted for nearly half the increase in global energy use over the past decade, and China was responsible for nearly half of global coal use in 2009 (IEA 2011). China, as well as India, are expected to lead in energy consumption growth in non-OECD²⁸ Asian regions, which is projected to rise by 91 percent from 2010 to 2035 (EIA 2012c).

At the same time, Mexico, Venezuela, and other large petroleum producers depend heavily on their crude oil exports to support their national economies. Just as Section 1.4, Market Analysis, found it unlikely that the proposed Project construction would have a substantial impact on the rate of oil sands development, these other petroleum producers are unlikely to forego crude oil sales if the U.S. substitutes Canadian oil sands crudes for Mexican and Venezuelan crudes. They can be expected to sell their crudes for whatever price the market will bear, and that would likely be to China. Similarly, all the production and transportation assets are in place for Saudi Arabia to supply the crude oil displaced from the U.S. market to any country in the world who will buy it.

Expanding electrical power generation in China is easier and more cost-effective with No. 6 fuel oil than coal. Both No. 6 fuel oil and coal have high sulfur contents, and China has significant air pollution problems primarily from coal power plants. So when China chooses to invest in a solution to air pollution, installing power plant flue gas scrubbers is a leading option. That will make No. 6 fuel oil equally suitable for power generation, but more economical in new power plants than coal. Therefore, it is more likely that worldwide crude oils displaced from the Gulf Coast refineries with Canadian oil sands crudes, will find their way to China, along with roughly the same amount of petroleum coke from the Gulf Coast, both displacing coal production in China.

²⁸ Organization for Economic Cooperation and Development.

Supplementing the worldwide crude oil market, Canadian oil sands crude would more likely substitute for expanded coal production in China rather than expand the use of solid carbon fuels (coal and coke) used in power generation in North America or China. With the discovery of economic production of light, sweet crude oils from hydraulic fracturing shale, the combination of expanded light U.S. crude and heavy Canadian oil sands production will likely not alter petroleum refining assets in the Gulf Coast with regard to coking capacity. Refineries designed to run primarily heavy crudes may have to add facilities to pre-distill light ends from light shale oil crudes, but the remaining secondary units of the refineries (vacuum distillation unit, gas oil cracking, coking, and hydrotreating distillate products) can be protected like any asset in place. In fact, the U.S. petroleum refining industry is gradually shrinking with competition from renewable energy (ethanol, wind, biodiesel) and natural gas entry into traditional crude oil transportation fuel markets. Refineries are projected to close down, and only selective capacity additions for processing expanded shale oil crude oils in conjunction with Canadian oil sands can be expected in the most profitable, large refineries.

6.0 INCREMENTAL GHG EMISSIONS OF DISPLACING REFERENCE CRUDES WITH WCSB OIL SANDS

As noted in Section 1.4 of the Supplemental EIS, the proposed Project would not substantially influence the rate or magnitude of oil extraction activities in Canada, or the overall volume of crude oil transported to the United States or refined in the United States. Thus, from a global perspective, the decision whether or not to build the Project will not affect the extraction and combustion of WCSB oil sands crude on the global market. However, on a life-cycle basis and compared with reference crudes refined in the United States, oil sands crudes could result in an increase in incremental GHG emissions.²⁹ Although a life-cycle analysis is not strictly necessary for purposes of evaluating the potential environmental impacts attributable to the proposed Project under NEPA, it is relevant and informative for policy-makers to consider in a variety of contexts.

For illustrative purposes, this Appendix provides information on the incremental life-cycle GHG emissions (in terms of the U.S. carbon footprint) from WCSB oil sands crudes likely to be transported by the proposed Project (or any transboundary pipeline). The incremental emissions are a function of:

- The throughput of the pipeline;
- The mix of oil sands crudes transported by the pipeline; and
- The GHG-intensity of the crudes in the pipeline compared to the crudes they displace.

²⁹ Note that a substantial share of these emissions would occur outside the United States. Also note that the U.S. National Inventory Report, like other national inventories, only characterizes emissions within the national border, rather than using a life-cycle approach. If the United States used a life-cycle approach, upstream emissions from other imported crudes would be attributed to the United States.

Acknowledging the methodological differences in GHG-intensity estimates between the studies, this section estimates weighted-average GHG emissions from WCSB oil sands crudes for a subset of the studies reviewed. The weighted-average results are used to estimate incremental GHG emissions from WCSB oil sands relative to displacing an equivalent volume of reference crudes in U.S. refineries.

6.1 WEIGHTED-AVERAGE GHG EMISSIONS FROM WCSB OIL SANDS CRUDES TRANSPORTED IN THE PROPOSED PROJECT

While Figure 4-5 and Figure 4-7 indicate the full range of life-cycle GHG emissions estimates associated with individual methods of oil sands production, the actual life-cycle GHG emissions of WCSB oil sands crude that would be imported by the proposed Project or a similar transboundary pipeline to the United States would be a weighted-average mix of crudes produced using different methods of extraction, upgrading or diluting, and petroleum coke management practices. For example, IHS CERA (2010) assumed an average 55 percent dilbit and 45 percent SCO for WCSB oil sands imported to United States, and NETL (2008) assumed 57 percent SCO and 43 percent crude bitumen.³⁰ In the Supplemental EIS, the Department assumes that the average crude oil flowing through the pipeline would consist of about 50 percent Western Canadian Select (dilbit) and 50 percent Suncor Synthetic A (SCO).

Estimating an average oil sands value allows for direct comparison with other average reference crude estimates, but it is difficult to characterize the average mix for WCSB oil sands due to the various: (i) methods of producing bitumen from oil sands deposits (i.e., mining versus in situ), (ii) fuel sources used (e.g., petroleum coke combustion versus natural gas import and electricity export), and (iii) products produced from these operations (i.e., dilbit, synbit, and SCO). The average mix of WCSB oil sands production will also change over time depending on factors such as the share of in situ extraction relative to mining, the use of coke as a fuel source, and upgrading capacity.

ICF applied the following method to develop a weighted-average estimate for WCSB oil sands crudes likely to be transported in the proposed Project. First, a subset of studies was established that provided sufficient information to develop a weighted-average GHG estimate for WCSB oil sands. Next, an estimated mix of WCSB oil sands crudes likely transported by the proposed Project in the near-term was developed. Finally, the studies' WTW GHG emission estimates for different WCSB oil sands crudes were applied to the mix of crudes likely to be transported by the proposed Project to calculate a weighted-average for WCSB oil sands crude for each study.

³⁰ There is a synergy between the two methods for producing and transporting bitumen down the pipeline in that the SCO upgrader produces steam and electricity that can be used in the SAGD process while mining is more energy-efficient in extracting bitumen from the field.

Only a subset of the studies included in this assessment provides sufficient information to develop a weighted-average GHG estimate for WCSB oil sands crude. To define sufficient information, the following criteria were applied:

- Study includes the WCSB oil sands crude types that are likely to be transported in the proposed Project. A 50/50 split between SCO and dilbit was assumed for consistency with the Final EIS.
- Study evaluates the full WTW life-cycle. Studies that evaluated only a portion of the life cycle (e.g., only WTR or up to the refinery gate) cannot be accurately compared with other studies on a full life-cycle basis.
- Study is a unique, original analyses, independent of other studies included in the review (i.e., not a meta-analysis of the same studies included in the review); several of the studies were meta-analyses that summarized or averaged the results from other studies already included in this review (e.g., IHS CERA [2010, 2011], Brandt [2011]).

The analysis also ensured that the studies used consistent functional units to evaluate WTW GHG emissions so that accurate comparisons could be made. Table 6-1 evaluates each of the studies included in this assessment against the criteria. Of the studies, Jacobs (2009), TIAX (2009), and NETL (2008, 2009) provided sufficient independent information to develop internally-consistent averages for the mix of WCSB oil sands crudes likely to be transported by the proposed Project.

Table 6-1 Evaluation of Studies that Provided Sufficient Independent, Comprehensive Information to Develop Weighted-Average GHG Emissions Estimates for WCSB Oil Sands Crudes

Study	Type	Includes crudes likely transported by proposed Project	Evaluates full WTW GHG emissions	Does not average across same studies already included in review	Meets criteria
NETL 2008; 2009	Individual LCA	Y ¹	Y	Y	Y
IEA 2010 ³	Meta-analysis	N ²	Y	N	N
IHS CERA, 2010	Meta-analysis	Y	Y	N	N
IHS CERA, 2011	Meta-analysis	Y	Y	N	N
NRDC, 2010	Meta-analysis	Y	Y	N	N
ICCT, 2010	Individual LCA	N ⁴	N ⁵	Y	N
Jacobs, 2009	Individual LCA	Y	Y	Y	Y
Jacobs, 2012	Individual LCA	Y	Y	Y	Y ⁷
TIAX, 2009	Individual LCA	Y	Y	Y	Y
Charpentier et al., 2009	Meta-analysis	N ⁶	Y	N	N
Brandt, 2011	Meta-analysis	Y	Y	N	N
RAND, 2008	Individual LCA	N ⁷	N ⁸	N	N
Pembina Institute, 2005	Partial LCA	N ⁹	N ¹⁰	Y	N
Pembina Institute, 2006	Partial LCA	N ¹¹	N ¹⁰	Y	N
McCann, 2001	Individual LCA	N ¹²	Y	Y	N
GHGenius, 2010	Model	N ¹³	Y	Y	N
GREET, 2010	Model	N ¹⁴	Y	Y	N

Study	Type	Includes crudes likely transported by proposed Project	Evaluates full WTW GHG emissions	Does not average across same studies already included in review	Meets criteria
Rooney et al., 2012	Land use change journal article	N ¹⁶	N ¹⁶	Y	N
Yeh et al., 2010	Land use change journal article	N ¹⁷	N ¹⁷	Y	N

¹ NETL assumed a mix of 43 percent blended bitumen and 57 percent SCO, and used crude bitumen as a proxy for the blended bitumen component.

² IEA includes estimates for high/low in situ and mining. Does not specify SCO or dilbit crude types.

³ IEA results are compared on a per-barrel-of-crude basis.

⁴ ICCT evaluates average mix of oil sands imported to Europe.

⁵ ICCT GHG emissions include refining, but exclude final distribution of premium fuel products.

⁶ Charpentier et al. did not evaluate dilbit as a crude pathway.

⁷ RAND only evaluated SCO from WCSB oil sands.

⁸ RAND only evaluated WTR GHG emissions.

⁹ Pembina (2005) only evaluated oil sands average, but did not specify the composition.

¹⁰ Pembina (2005, 2006) only evaluated WTR GHG emissions.

¹¹ Pembina (2006) only evaluated GHG emissions from SCO.

¹² McCann only evaluated GHG emissions from SCO.

¹³ McCann results are compared on a per-1,000-liters-of-transportation fuel basis.

¹⁴ GHGenius does not include a pathway for dilbit production; the model only includes bitumen ((S&T)² Consultants 2008b).

¹⁵ Published estimates for SCO and dilbit from WCSB oil sands crudes were not located for GREET, and development of these factors was beyond the scope of this assessment.

¹⁶ Rooney et al. (2012) only evaluated GHG emissions from local land-use change.

¹⁷ Yeh et al. (2010) only evaluated GHG emissions from local land-use change and tailing ponds.

GHG = greenhouse gas LCA = life-cycle assessment, N = no, WTW = well-to-wheels, Y = yes.

It is assumed that 50 percent of pipeline throughput will be SCO, and 50 percent will be dilbit (as discussed in the Supplemental EIS). According to the Alberta Energy Resources Conservation Board (ERCB 2010), all WCSB dilbit is currently produced using in situ production. All WCSB bitumen produced from mining is upgraded to SCO and 12 percent of SCO is produced via in situ methods (ERCB 2010, pp. 2-18, 2-24). Applying this production mix to a 50/50 split of SCO and dilbit yields an estimated mix of 50 percent in situ-produced dilbit, 44 percent mining-produced SCO, and 6 percent in situ-produced SCO transported in the proposed Project.

WTW GHG emissions for in situ dilbit, in situ SCO was evaluated, and mining SCO in Jacobs (2009) and TIAX (2009) using the following assumptions:

- For Jacobs (2009):
 - In situ SCO: The average of SAGD SCO from delayed coking and ebulating bed hydrocracking for WTW GHG emissions was used. Jacobs (2009) did not provide estimates for other types of in situ production methods, and assumed that all petroleum coke is stockpiled or buried at WCSB oil sands facilities.
 - In situ dilbit: Jacob's estimate for WTW GHG emissions from SAGD dilbit, assuming diluent is consumed at the refinery, was applied. Recirculation of diluent to Alberta was not included since diluent will not be recirculated by the proposed Project.
 - Mining SCO: Jacob's estimate for mining SCO from delayed coking was used.

- For TIAX (2009):
 - In situ SCO: A weighted average of WTW GHG emissions from SAGD SCO where petroleum coke is buried (i.e., TIAX's bury coke scenario), and where it is used as a fuel (i.e., TIAX's use coke scenario) was taken. It was assumed that 75 percent of petroleum coke is stockpiled, and 25 percent is used as fuel, based on data from ERCB (ERCB 2010, p. 2-30).³¹
 - In situ dilbit: The average of TIAX's WTW GHG emissions estimates for facilities that export electricity and do not export electricity was taken. A weighted average was calculated between dilbit from SAGD and CSS facilities, assuming 53 percent SAGD and 47 percent dilbit, based on ERCB (ERCB 2010, p. 2-22).³²
 - Mining SCO: TIAX's estimate for mining SCO was used, assuming that all petroleum coke is buried. TIAX did not investigate a scenario where petroleum coke produced from mining SCO is used as a fuel.
- For NETL (2008):
 - Because NETL provided an average Canadian oil sands value assuming a 43 percent mix of blended bitumen and 57 percent SCO, it was not necessary to calculate a weighted average, though as a result the underlying GHG intensities are not on an equal mathematical footing with the values computed from the Jacobs and TIAX studies. Because the NETL study did not decompose the value into its constituent parts, it was not possible to adjust the underlying percentages to represent the same pipeline mix.

Table 6-2 provides the WTW GHG emission estimates in each study for the weighted-average WCSB oil sands crude likely to be transported in the proposed Project and the other reference crudes included in the scope of this assessment. These results are near-term averages for WCSB oil sands crudes likely to be transported in the proposed Project. They are based on current industry-average production mixes and practices, which are likely to change over time.

³¹ Based on industry-average practices reported by ERCB (ERCB 2010, pp. 2-24, 2-30). Petroleum coke is produced at upgraders operated by Suncor Energy Inc., Syncrude Canada Ltd., Canadian Natural Resources Ltd. (CNRL), and Nexen Inc. Suncor represents 45 percent of SCO production from these facilities and uses roughly 26 percent of its petroleum coke as fuel, with 7 percent sold to other sources. Syncrude represents 46 percent of SCO production and uses 21 percent of petroleum coke as fuel. CNRL represents 8 percent of SCO production and stockpiles all of its coke. Nexen represents 1 percent of SCO production and gasifies all its coke for process heat and hydrogen production. Weighting coke management practices by SCO production for each facility yields a coke stockpiling-to-use ratio of 75 to 25 percent across all facilities.

³² According to ERCB, of *in situ* bitumen produced from SAGD and CSS, SAGD represented 53 percent of production in 2009, and CSS accounted for 47 percent of production (ERCB 2010, p. 2-22). Primary production of bitumen (i.e., using conventional oil production techniques) accounted for 32.9 thousand m³ per day, or 14 percent of total oil sands production in 2009, but was not included since GHG emission estimates for this production method were not provided in the studies included in the scope of this assessment.

Table 6-2 WTW GHG Emissions Estimates for Weighted-Average WCSB Oil Sands Crude Likely to be Transported in the Proposed Project and Other Reference Crudes, by Study

Study	Crude type	WTW GHG Emissions gCO ₂ per MJ (LHV)		
		Gasoline	Diesel	Kerosene/Jet Fuel
Jacobs 2009	WCSB oil sands (average) ²	107 / 109 ³	105	N/A
	In situ SCO	118 / 117 ³	114	N/A
	In situ dilbit	106 / 108 ³	103	N/A
	Mining SCO	108 / 108 ³	105	N/A
	Middle Eastern Sour	98 / 99 ³	98	N/A
	Mexican Maya	102 / 102 ³	103	N/A
	Venezuelan	102 / 102 ³	100	N/A
TIAX 2009	WCSB oil sands (average) ²	104	95	N/A
	In situ SCO	115	109	N/A
	In situ dilbit	105	96	N/A
	Mining SCO	102	92	N/A
	Middle Eastern Sour	91	83	N/A
	Mexican Maya	93	86	N/A
	Venezuelan	102	91	N/A
NETL 2008, 2009	WCSB oil sands (average)	106	105	102
	U.S. Average (2005)	91	90	88
	Middle Eastern Sour	89	89	86
	Mexican Maya	94	96	91
	Venezuelan ¹	90	90	87

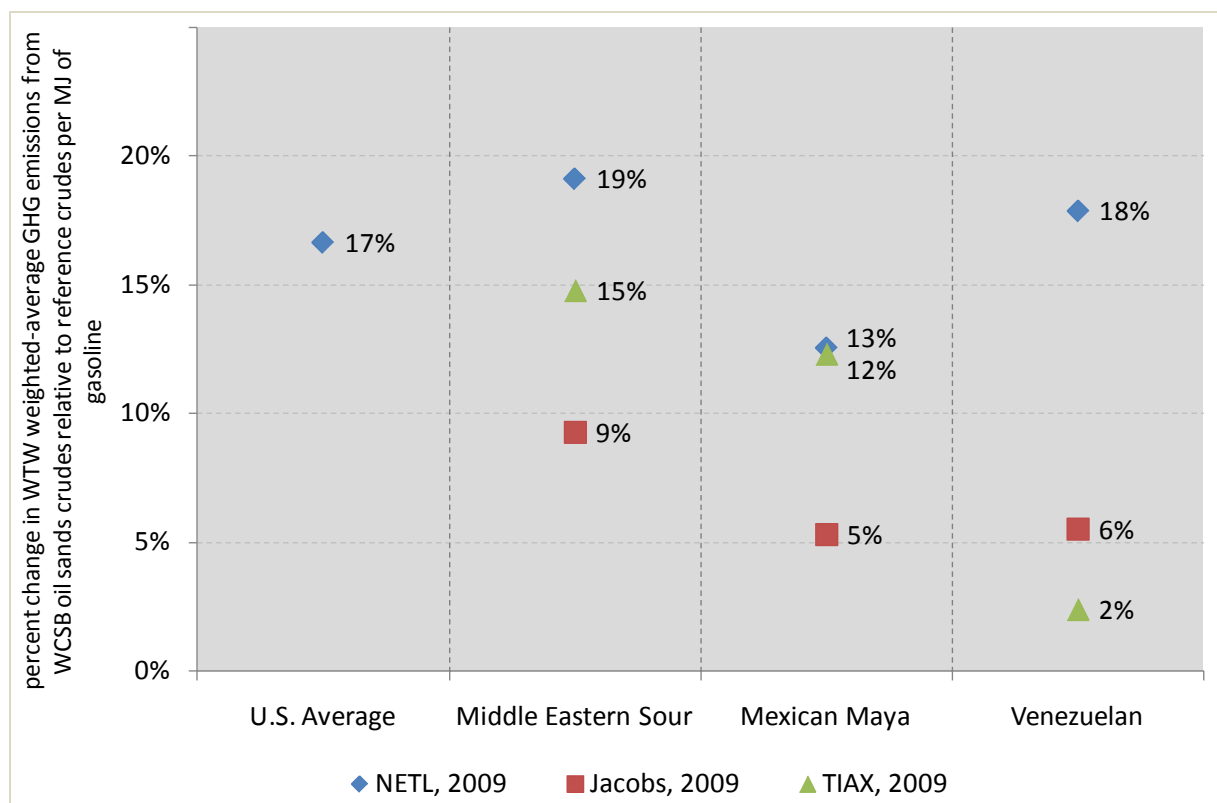
¹ Venezuela Conventional is used as the NETL reference crude for Venezuela Bachaquero in this analysis; this is a medium crude, not a heavy crude.

² Weighted-average of WCSB oil sands crudes, assuming 50 percent in situ-produced dilbit, 44 percent mining-produced SCO, and 6 percent in situ-produced SCO.

³ Jacobs (2009) provided results in terms of reformulated blendstock for gasoline blending (RBOB) and conventional blendstock for gasoline blending (CBOB); the results for gasoline are given here as RBOB/CBOB.

GHG = greenhouse gas, N/A = Estimates not available from study, gCO₂ per MJ = grams carbon dioxide per megajoule, LHV = lower heating value, SCO = synthetic crude oil, WCSB = Western Canadian Sedimentary Basin, WTW = well-to-wheels.

Figure 6-1 indicates the GHG intensity of crudes likely to be transported in the proposed Project relative to each of the four reference crudes on a gasoline basis. Across all reference crude types, the results show a 2 to 19 percent increase in WTW GHG emissions from the weighted-average mix of oil sands crudes expected to be transported in the proposed Project relative to the reference crudes in the near term. Heavier crudes generally take more energy to produce and emit more GHGs than lighter crudes, and in particular, the weighted-average WCSB oil sands crude is currently more energy- and carbon-intensive than lighter crudes like Middle Eastern Sour. Although the three studies have underlying differences in assumptions, the comparisons illustrated in Figure 5-1 are internally consistent in that they make comparisons between crudes from the same study.



Sources: NETL 2009, Jacobs 2009, TIAX 2009

Notes:

1. In this chart, all emissions are per megajoule of reformulated gasoline with the exception of NETL 2009, which is per megajoule of conventional gasoline.
2. Venezuela Conventional is used as the NETL reference crude for Venezuela Bachaquero in this analysis; this is a medium crude, not a heavy crude; thus, the NETL values are compared against a lighter Venezuelan reference crude than other studies.
3. The percent differentials refer to results for scenarios from the various studies and are calculated using the oil sands results relative to the corresponding study's reference crude.

GHG = greenhouse gas, WCSB = Western Canadian Sedimentary Basin, WTW = well-to-wheels.

Figure 6-1 Percent change in near-term WTW weighted-average GHG emissions from the mix of WCSB oil sands crudes that may be transported in the proposed Project relative to reference crudes

6.2 INCREMENTAL GHG EMISSIONS FROM DISPLACING REFERENCE CRUDES WITH WCSB OIL SANDS CRUDES IN U.S. REFINERIES

This section applies weighted-average WTW GHG emissions for WCSB oil sands crude to the expected initial and potential capacities of the proposed Project to calculate the potential total WTW GHG emissions added to the U.S. carbon footprint, on a life-cycle basis, from the crude transported by the proposed Project. This is compared against the WTW GHG emissions from an equivalent volume of each of the four reference crudes (i.e., U.S. average in 2005, Middle Eastern Sour, Mexican Maya, and Venezuelan Bachaquero) to calculate the total incremental GHG emissions from displacing these reference crudes with WCSB oil sands in U.S. refineries.

These results only consider the effect of displacing these reference crudes in U.S. refineries; they do not estimate how global markets for WCSB oil sands crudes would be affected by the proposed Project. This is discussed elsewhere in the Supplemental EIS.

In order to assess the total WTW GHG emissions associated with weighted-average WCSB oil sands crudes likely to be transported in the proposed Project, it is necessary to account for the various refined products produced from the crude. Therefore, the crude pipeline capacity was converted from barrels of crude to an equivalent yield of gasoline and distillate products (i.e., the functional unit of per barrel of premium refined fuel products) using the data provided in Table 6-3 for each respective study. NETL and TIAX provide average U.S. refinery yields of gasoline and distillates, whereas Jacobs provides yields for individual crudes, including WCSB SCO and dilbit.

Table 6-3 Yield of Gasoline and Distillates and Equivalent Barrels of Gasoline and Distillates from 100,000 Barrels of Crude Oil (MMTCO₂e)

Study ¹	Yield of gasoline and distillates ² per barrel of crude oil	Equivalent barrels of gasoline and distillates produced from 100,000 barrels of crude oil	Source
Jacobs	95%	94,738	Jacobs 2009, p. 5-18
TIAX	82%	82,114	TIAX 2009, p. E-1
NETL	77%	77,000	NETL 2008, p. 83

¹ The NETL and TIAX yields are based on average U.S. refinery product yields, whereas the Jacobs yield is based on the product yield from refining SCO and dilbit crudes.

² The yield of gasoline and distillates (i.e., premium fuel products) is calculated for each study as the total volume of gasoline, diesel, and kerosene or kerosene-based jet fuel, divided by total refinery output.

MMTCO₂e = million metric tons carbon dioxide equivalent.

The WTW GHG intensity of weighted-average WCSB oil sands crude likely to be transported in the proposed Project and other reference crudes are shown in Table 6-2 in terms of the functional unit of per megajoule of gasoline, diesel, and jet fuel products. The GHG intensities are converted to a weighted-average functional unit of barrels of gasoline and distillates (i.e., the total sum of gasoline, diesel, and jet fuel products) based on the relative yield of gasoline and distillates from each study.^{33,34}

With similar functional units (i.e., barrels of gasoline and distillates) of the crude transported via the proposed Project and the weighted average WTW GHG emissions associated with oil sands crudes production, total WTW GHG emissions are calculated based on operational volume capacities of the pipeline. Similarly, the WTW GHG emissions associated with reference crudes is calculated in terms of the functional unit of barrels of gasoline and distillate yield based on operational volume capacities of the pipeline.

³³ For NETL, the relative yield of gasoline, diesel, and kerosene/jet fuel as a percentage of gasoline and distillates is 58%, 30%, and 12% respectively based on the volumetric fraction of total refinery production (NETL 2008, Table 4-54). For Jacobs, the relative yield of RBOB, CBOB, and diesel was calculated for each crude based on the refinery product yields in Table 5-4 (2009, p. 5-18). For TIAX, the relative yield of gasoline, diesel, and jet fuel is 57%, 32%, and 11% respectively, based on the U.S. average modeling results provided in Table E-1 (2009, p. E-1).

³⁴ Since TIAX did not provide GHG intensity results for jet fuel, ICF calculated the weighted-average assuming that the GHG intensity was similar to diesel on an energy basis, and using the energy content values for diesel and jet fuel in Table E-1.

Using the weighted-average estimate for the mix of WCSB oil sands crudes likely to be transported in the proposed Project, the incremental annual WTW GHG emissions associated with displacement of 100,000 barrels of each reference crude oil per day with WCSB oil sands crude oil are shown in Table 6-4. The incremental GHG emissions were calculated by subtracting from the WTW GHG emissions an equivalent displaced volume of each reference crude..

Table 6-4 Incremental Annual GHG Emissions of Displacing 100,000 Barrels per Day of each Reference Crude with WCSB Oil Sands (MMTCO₂e)

Reference Crude	Jacobs, 2009	TIAX, 2009 ¹	NETL, 2009 ¹
Middle Eastern Sour	1.3	2.0	2.5
Mexican Maya	0.5	1.6	1.7
Venezuelan ²	0.4	0.5	2.4
U.S. Average (2005)	NA	NA	2.3

Note: The incremental annual GHG emissions presented here are calculated using internally consistent comparisons for each reference crude and the weighted average WCSB oil sands crude using information from each respective study. The incremental annual GHG emissions estimates for displacing the U.S. average (2005) reference crude is only provided for NETL (2009) because only NETL included a U.S. average reference.

¹ The NETL and TIAX studies allocate a portion of GHG emission to co-products other than gasoline, diesel, and jet fuel products, which are not accounted for in these estimates. As a result, incremental GHG emissions are underestimated for those studies.

² Venezuelan conventional crude values for NETL refer to a medium crude, not the heavy crude Venezuelan Bachaquero.

NA = not applicable, MMTCO₂e = million metric tons carbon dioxide equivalent, WCSB = Western Canadian Sedimentary Basin.

The incremental GHG emissions in Table 6-4 are compared against four different reference crude oils. To the extent that Middle Eastern Sour is the world balancing crude, it may ultimately be the crude that is backed out of the world market by WCSB oil sands crudes. From another perspective, if the proposed Project is built and the PADD III refineries continue using about the same input mix of heavy crudes as they currently use, Venezuelan Bachaquero or Mexican Mayan are likely to be displaced by WCSB oil sand crudes. Finally, NETL (2009) estimated the GHG emissions intensity of the average barrel of crude oil refined in the United States in 2005. The Jacobs and TIAX studies are not compared to this reference crude because they did not include a U.S. average estimate.

The three studies referenced in Table 6-4 used different methods to allocate GHG emissions between premium fuels (e.g., gasoline, diesel, and jet fuel) and other co-products (e.g., light and heavy ends, petroleum coke, sulfur). Jacobs (2009) attributes all GHG emissions associated with extracting, refining, and distributing other co-products to premium fuels,³⁵ so the incremental GHG emissions for Jacobs (2009) in Table 5-4 do take into account the production and use of these co-products.

As noted elsewhere in the Supplemental EIS, the initial throughput of the proposed Project is projected to be 830,000 barrels of crude per day with 100,000 barrels per day supplied by Bakken crude production and the remaining 730,000 barrels per day supplied by the WCSB oil

³⁵ Jacobs (2009) also applies a substitution credit for offsetting other products that are replaced by each of the co-products. For example, the production and use of petroleum coke is assumed to offset GHG emissions from coal-fired electricity production.

sands. However, assuming that the full 830,000 bpd capacity of the pipeline is used to transport only WCSB crude, and based on the results in the Jacobs (2009) study, incremental GHG emissions from the proposed Project would be 11.1 million metric tons of CO₂ equivalent (MMTCO₂e) if the oil sands crude oil transported by the proposed Project offset an equivalent amount of Middle Eastern Sour crude oil. Incremental emissions would be 4.4 MMTCO₂e annually if oil sands crude oil offset Mexican Maya crude oil and 3.7 MMTCO₂e annually if Venezuela Bachaquero crude oil were offset.

Unlike the Jacobs study, the NETL and TIAX studies allocate a portion of GHG emissions to co-products other than gasoline, diesel, and jet fuel products, and these emissions are not included in the WTW GHG results shown in Table 6-2. As a result, the incremental GHG emissions estimates for TIAX and NETL in Table 5-4 may underestimate total incremental GHG emissions.³⁶

TIAX found that the change in refinery energy use associated with an incremental barrel output of co-products other than gasoline, diesel, and jet fuel contributed to less than 1 percent of energy use and GHG emissions per barrel of refined product at the refinery, so any error introduced by the underestimate of GHG emissions attributed to co-products is negligible (TIAX 2009, p. 34; Appendix D, p. 42). According to the results of the TIAX study, incremental GHG emissions from the portion of WCSB oil sands crudes transported by the proposed Project would be 16.7 MMTCO₂e if oil sands crude oil offset an equivalent amount of Middle Eastern Sour crude oil. Incremental emissions would be 13.4 MMTCO₂e and 4.0 MMTCO₂e annually if oil sands crudes offset Mexican Maya and Venezuelan Bachaquero crude oil, respectively.

Based on the results of NETL (2009), incremental emissions from the portion of WCSB oil sands crudes transported by the proposed Project would be 20.7 MMTCO₂e annually if oil sands crude oil offset an equivalent amount of Middle Eastern Sour crude oil. Incremental emissions would be 13.8 MMTCO₂e and 19.5 MMTCO₂e annually if oil sands crudes offset Mexican Maya and Venezuelan Bachaquero crude oil, respectively. Compared to the average barrel of crude oil refined in the United States in 2005, incremental emissions from oil sands crudes would be 18.7 MMTCO₂e annually. The effect of allocating a portion of the life-cycle GHG emissions of refining crude oils to other, non-premium co-products was larger in the NETL study than in either of the studies by Jacobs (which did not allocate any emissions to other co-products) or TIAX (which allocated less than 1 percent of GHG emissions at the refinery to other co-products). To estimate the magnitude of this effect, the NETL results for WCSB oil sands and the 2005 U.S. average crude oils were adjusted to include other product emissions modeled in NETL's analysis. The lead NETL study author was contacted to vet the approach used to make this adjustment in order to ensure that it was made consistently with the NETL study framework (Personal communication, Timothy Skone, 2011). Adjusting the NETL results to include other

³⁶ Adjusting the TIAX and NETL GHG emission estimates to include co-products other than gasoline, diesel, and kerosene/jet fuel would require two pieces of information: (i) the GHG intensity of the other products, for both WCSB crudes and reference crudes, and (ii) the yield of the other products, for both WCSB crudes and reference crudes. TIAX (2009) and NETL (2008) do not provide explicit emissions intensity factors or product yields in a format that enables separate emissions estimates to be developed for these products. These products largely comprise the remaining fractions of the input crude that cannot be converted into premium products, and take relatively little incremental energy and GHG emissions to produce.

product emissions could increase the differential in incremental emissions from displacing the 2005 U.S. mix of crude oils with WCSB oil sands crude by roughly 30 percent.

The full range of incremental GHG emissions associated with the displacement of the reference crudes by the WCSB oil sands crude estimated from the quoted subset of studies is 3.7 to 20.7 MMTCO₂e annually. This is equivalent to annual GHG emissions from combusting fuels in approximately 770,800 to 4,312,500 passenger vehicles or the CO₂ emissions from combusting fuels used to provide the energy consumed by approximately 190,400 to 1,065,400 homes for one year.³⁷

The increments presented here are based on life-cycle emission estimates for current or near-term conditions in the world oil market. Over time, however, the GHG emission estimates for fuels derived from both WCSB oil sands crude oils and the reference crude oils are likely to change. For instance, it will become more energy-intensive to produce reference crudes over time as fields mature and secondary and tertiary recovery techniques, such as CO₂ flooding are required to maintain production levels (see Section 4.2.2.1 Artificial Lift Assumptions).

At the same time, in situ extraction methods are projected to represent a larger share of the overall oil sands production – increasing from about 45 percent of 2009 oil sands production to an estimated 53 percent by 2030 (ERCB 2010). In particular, the share of SAGD in situ extraction methods are projected to rise from roughly 18 percent in 2009 to 40 percent of oil sands production in 2030 (IHS CERA 2011).³⁸ Although it is unclear how the GHG-intensity of reference crudes relative to WCSB oil sands crudes will change over time, it is likely that GHG intensity for future reference crudes will trend upward at a slightly faster rate than WCSB oil sands-derived crudes. If this is the case, the differential in WTW GHG emissions of WCSB oil sands crudes is likely to decrease relative to reference crudes.

7.0 KEY FINDINGS

Life cycle assessment is a useful analytical tool for evaluating the climate change implications of refining one fuel source in the United States relative to another. It is suitable for this application because it allows for a more complete understanding of the climate change impacts. The GHGs associated with extraction of crude from a reservoir through refined fuel combustion in vehicles can be expressed in a single metric of CO₂-equivalent GHG emissions per unit of transportation fuel; the emissions have the same effect on global climate change regardless of where they are emitted (e.g., whether in Alberta, Saudi Arabia, Venezuela, or Mexico during crude production and widely dispersed during fuel combustion). In addition, LCA has a precedent and regulatory standing in similar fuel-related policy issues, such as USEPA's Renewable Fuel Standard (RFS2) and the State of California's Low Carbon Fuel Standard (LCFS).

Applying LCA to petroleum systems is at the cutting-edge of LCA state of the art. The complex life cycle of fuels requires the consideration of a large number of analytical design issues. As

³⁷ Equivalencies based on USEPA's GHG Equivalency calculator available at: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

³⁸ Although the balance of mining and *in situ* extraction will change in the future, there are incentives for producers to keep GHG intensity as low as possible. For example, Alberta's climate policy requires that oil sands producers and other large industrial GHG emitters reduce their emissions intensity by 12 percent from an established baseline.

discussed in Section 4.1, Study Design Factors, these include developing rules for how to handle co-products (Section 4.1.4, Allocation, Co-Products, and Offsets) within the study's system boundaries or to allocate the GHG emissions associated with production and use of these outputs outside the boundaries. The choice of functional unit (Section 4.1.5, Metrics), whether in terms of a barrel of crude, a barrel of refined premium fuel products (including or excluding co-products), or a barrel of a specific product such as gasoline or diesel, also influences the presentation of the results. Finally, the design life of the proposed Project and the likelihood of substantial changes in emissions intensity over time make the results sensitive to the study timeframe (Section 4.1.2, Time Period) and any assumptions used to forecast future trends in technology, fuel use, global oil supply, and extraction methods. It is necessary to be aware of each LCA study's treatment of these issues to understand the results and to make meaningful comparisons of the life-cycle GHGs from different crude sources.

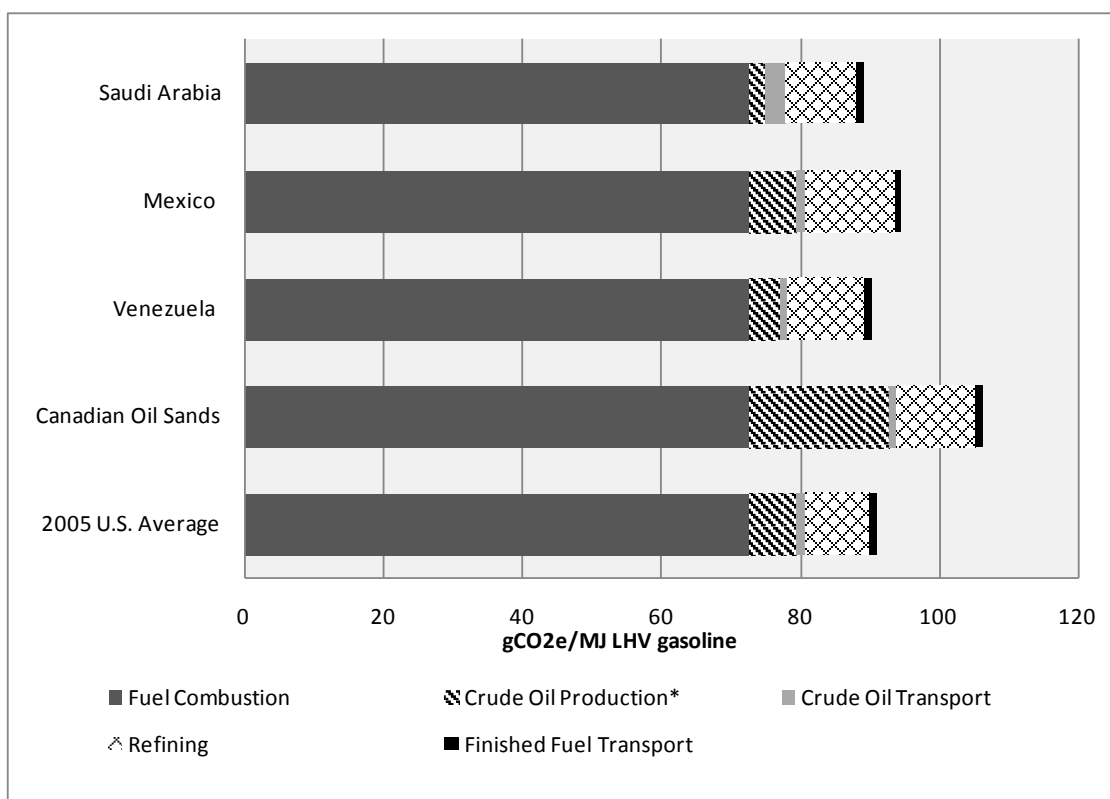
In addition, information on a large number of individual inputs and assumptions (Section 4.2, Input and Modeling Assumptions) is necessary to capture the relative life-cycle GHG emissions between fuels in sufficient detail. In many cases, key information and data sources are proprietary or not otherwise publicly available, which reduces the quality or transparency (Section 4.3, Data Quality and Transparency) (and sometimes both) of the final results. This can make it difficult to resolve discrepancies between different studies or to identify the underlying drivers behind variation in the results of WTW LCAs.

Despite the wide variation in design, inputs, and assumptions within the LCA studies reviewed, several key findings emerge. The following findings are clearly supported by the LCA results:

1. WCSB crudes, as likely transported through the proposed Project, are on average more GHG-intensive than the crudes they would displace in the United States. In a comparison of the relative increase in weighted-average GHG emissions between WCSB oil sands-derived crudes that would likely be transported by the proposed Project and other reference crudes, each of the three most comprehensive and comparable WTW studies show that WCSB oil sands have higher life-cycle GHG emissions than the four reference crudes. The difference between WCSB oil sands and heavy Mexican and Venezuelan crudes is narrower than lighter crudes, such as Middle Eastern Sour. Thus, the life-cycle carbon footprint, for transportation fuels produced in U.S. refineries, would increase if the project were approved.
2. The Supplemental EIS examined the potential for growth-induced impacts that could be associated with the proposed Project in Section 1.4, Market Analysis, and it is unlikely that construction of the proposed Project would have a substantial impact on the rate of development of the WCSB oil sands. As described in Section 1.4, even when considering the incremental cost of non-pipeline transport options, should the proposed Project be denied, a 0.4 to 0.6 percent reduction in WCSB production could occur by 2030, and should both the proposed Project and all other proposed pipeline projects not be built, a 2 to 4 percent decrease in WCSB oil sands production could occur by 2030. Based on the market analysis in Section 1.4, the incremental life-cycle emissions associated with the proposed Project are estimated in the range of 0.07 to 0.83 MMTCO₂e annually if the proposed Project were not built, and in the range of 0.35 to 5.3 MMTCO₂e annually if all pipeline projects were denied, based on the following:

- a. The full range of incremental GHG emissions associated with the more carbon-intensive WCSB oil sands that would be transported through the proposed Project across the analyzed reference crudes (which could be displaced at the Gulf Coast refineries) is estimated to range from 3.3 to 20.8 MMTCO₂e annually (the methodology used to derive this range is explained further in this section).
 - b. If the proposed Project was not built, analysis demonstrates that WCSB oil sands would likely be developed, but there is potentially a 0.4 to 0.6 percent reduction in production, and if all other proposed pipeline projects were not built, there would potentially be a 2-4% reduction in WCSB oil sands production.
 - c. The range of GHG emissions represents the incremental GHG emissions for displacement of the analyzed reference crudes for the stated scenarios.
3. A large source of variance for a given crude across the studies is the treatment of lower-value products such as petroleum coke, electricity exports from cogeneration, and secondary carbon effects such as land-use change and capital equipment. The primary flows of energy and carbon from the premium fuel products produced at the refinery are generally well-understood and characterized across the various studies. In contrast, the treatment of lower-value products, electricity imports and exports, and secondary carbon flows varies widely across the various studies, as shown in Table 4-11. Many of these factors have a medium to large effect on WTW emissions. The different treatments of secondary flows contribute to a large portion of the variation in the results across the studies.
4. Upgrading bitumen to allow its flow through a pipeline shifts a portion of the GHG emissions from refining to further upstream in the life cycle, i.e., just prior to crude transport. Upgrading bitumen into SCO removes the light ends and heavy residuum ahead of transport to the refinery. As a result, a barrel of SCO will produce a greater quantity of premium products than a barrel of full-range reference crudes that have not been upgraded. Furthermore, a barrel of dilbit contains 30 percent diluents (that do not make significant contribution to gasoline) and 70 percent bitumen (with a high fraction of residuum, requiring a higher amount of energy-intensive coking to make gasoline and distillate fuels along with a higher fraction of petroleum coke than light crudes). Although a number of studies did not account for this effect, refinery models used by Jacobs (2009, 2012) and TIAX (2009) validated this result. Studies that do not account for the reduction in refinery energy use for SCO will overestimate the GHG emissions from SCO relative to other crude sources.
5. The relative GHG-intensity of both reference crudes and oil sands-derived crudes will change differently over time. The studies reviewed in this assessment represent a current snapshot of life-cycle emissions within the studies for given reference years, shown in Table 4-11. The life-cycle GHG emissions of both WCSB oil sands and reference crudes, however, will change differently over time. Conventional (deep) crude reservoirs require higher energy intensive secondary and tertiary production techniques as the reservoirs deplete and as water cut of the produced reservoir fluids increases, and even the best recovery techniques capture less than 50 percent of the original oil in place. Oil sands surface mining, given the vast aerial extent of the WCSB and that mining recovers 100 percent of the crude oil in place, is expected to have a relatively constant energy intensity long into the future.
6. The largest share of GHG emissions from the fuel life-cycle occurs from combustion of the fuel itself, regardless of the study design and input assumptions. The study design and input

assumption factors discussed above concern only 20 to 30 percent of the WTW GHG emissions for most fuels. The remaining 70 to 80 percent result from refined fuel products combustion. Figure 7-1 shows the contribution from fuel combustion (i.e., tank-to-wheel [TTW] emissions) relative to extraction, refining, transportation and distribution (i.e., WTT emissions) for gasoline produced from reference and oil sands-derived crudes (NETL 2008). When WTT emissions and combustion emissions are evaluated together, the percentage change in WTW GHG emissions are much smaller than on a WTT basis.



Source: Developed with results data from NETL 2009.

* Includes upgrading for WCSB oil sands.

gCO₂e/MJ = grams carbon dioxide equivalent per megajoule, LHV = lower heating value, WCSB = Western Canadian Sedimentary Basin.

Figure 7-1 WTW GHG emissions by life-cycle stage for WCSB oil sands average crude (i.e., Canadian Oil Sands) and reference crudes

In contrast with the above list of robust findings, the results from the studies included in the scope of this assessment differ on the following points:

- It is not clear whether WCSB oil sands-derived crudes are currently more GHG-intensive than other heavy crudes or crudes with high flaring rates. The life-cycle GHG emissions of WCSB oil sands crudes can fall within the same range as heavier crudes such as heavy Venezuelan crude oil and California heavy oil, and lighter crudes that are produced from

operations that flare most of the associated gas (e.g., Nigerian light crude). The overall results vary by study, however, and are driven by study design factors, such as the type of WCSB oil sands extraction method evaluated, the extraction methods and properties of the reference crude that WCSB oil sands crudes are compared against, as well as study-specific inputs and assumptions including treatment of petroleum coke, cogeneration, and secondary carbon flows.

- There is no common set of LCA boundaries or metrics for comparing WTW GHG emissions across different fuels and crudes. For example, key design issues where studies differ include: (i) treatment of petroleum coke and lower-value products; (ii) the functional unit, or metrics used to present WTW GHG emissions; (iii) methods of estimating and including secondary carbon flows, such as direct and indirect land use change, and capital infrastructure. In some cases (e.g., selection of LCA boundaries and functional unit), these issues will be determined by the ultimate study goal or purpose; in other cases, there is no established method or approach for including certain emissions (e.g., land-use change and capital equipment).
- It is not clear how changes in technology will affect the relative GHG-intensity of reference crudes and WCSB oil sands-derived crudes, but it is believed the gap between these crudes is more likely to narrow than widen. The life-cycle GHG emissions of WCSB oil sands and reference crudes will change over time, but it is not clear how these changes will impact the relative GHG emissions of reference crudes relative to WCSB oil sands crudes. On one hand, secondary and tertiary recovery techniques will become necessary to extract larger shares of oil, increasing the GHG emissions of reference crudes. ExxonMobil has made the point in *The Outlook for Energy, A View to 2030, 2005 Edition*, that the best tertiary recovery techniques can recover approximately 40 to 45 percent of the original oil in place, and while the industry does not know what the next best extraction techniques will be, the industry will not leave 55 percent of the World's proven reserves in the ground. Exploration for new oil reservoirs will also continue, while the location and extent of WCSB oil sands is well understood. On the other hand, in situ extraction, which is generally more energy- and GHG-intensive than mining, will represent a larger share of oil sands production in the future, although technical innovation will likely continue to reduce the GHG intensity. Technologies for combusting or gasifying petroleum coke may also become more prevalent in WCSB oil sands (or reference crude) operations, increasing GHG emissions. Over the longer term, CCS technologies could capture and sequester CO₂ emissions, reducing the GHG footprint of WCSB oil sands crudes; the timeframe for adopting CCS at oil sands facilities is highly uncertain (on the order of two or more decades), and similar technologies would be applicable to concentrated streams of CO₂ released from reference crude production facilities.
- The oil sands' GHG results do not necessarily represent the average or actual oil sands composition (i.e., the types and shares of oil sands-derived crudes) that would flow through the proposed Project pipeline. Some studies provide averages (e.g., NETL provides a WCSB oil sands average that is comprised of 57 percent SCO and 43 percent bitumen; IHS CERA (2010) provides an average for WCSB oil sands imported to the United States assuming 55 percent dilbit and 45 percent SCO) while others include results for several types of oil sands and different scenarios that vary the treatment of petroleum coke and other factors. Elsewhere in this Supplemental EIS, the Department assumes that the average crude oil

flowing through the pipeline would consist of about 50 percent Western Canadian Select (dilbit) and 50 percent Suncor Synthetic A (SCO). Although an average GHG-intensity estimate for WCSB oil sands allows for a direct comparison to other reference crudes imported to the United States, it is difficult to characterize the average mix due to variations and uncertainty in: (i) methods of producing bitumen from oil sands deposits (i.e., mining versus in situ), (ii) fuel sources used (e.g., combustion of petroleum coke versus natural gas, export of electricity), and (iii) products produced from these operations (i.e., dilbit, synbit, and SCO). These mixes are likely to change over time as well.

Table 7-1 provides a summary of the key drivers that influence the WTW GHG emissions from the studies included in this assessment. The vertical columns establish whether each driver results in an increase or decrease in GHG emissions from WCSB oil sands crudes relative to reference crudes, or if the result is uncertain. The horizontal rows group each driver according to its magnitude of impact on WTW GHG emissions (i.e., small, medium, or large), as discussed in Sections 4.1, 4.2, and 0, Study Design Factors, Input and Modeling Assumptions, and Analysis of Key Factors. The magnitude of impact is based on a synthesis of the estimates cited throughout the life-cycle studies reviewed.

Table 7-1 Summary of Key Factors, their Magnitude of Impact on WTW GHG Emissions, and their Effect on GHG Emissions of WCSB Oil Sands Crudes Relative to Reference Crudes

Magnitude of Impact ¹	Change in GHG emissions of WCSB oil sands crudes relative to reference crudes		
	Increase	Decrease	Uncertain
Large	<ul style="list-style-type: none"> • Including a credit for fuels offset by petroleum coke combustion at the refinery • Using residual products (such as petroleum coke) instead of natural gas at upgrading • Increased combustion of coke at oil sands facilities • Comparing WCSB oil sands crudes against lighter reference crudes • Comparing higher GHG-intensity WCSB oil sands production methods (e.g., in situ) to reference crudes • For dilbit: recirculating diluent from refineries back to Alberta 	<ul style="list-style-type: none"> • Inclusion of production and combustion emissions from petroleum coke and other co-products produced at refinery • Including emissions credit for electricity export from oil sands facilities • Accounting for artificial lift, water, and gas treatment in reference crude production • Future increases in secondary and tertiary production of reference crudes • Comparing WCSB oil sands crudes against heavier reference crudes • Comparing lower GHG-intensity WCSB oil sands production methods (e.g., mining) to reference crudes 	<ul style="list-style-type: none"> • Future changes in GHG intensity of oil sands crudes • Adoption of carbon capture and storage technologies • Including upstream production of purchased electricity and fuels brought on-site • Including emissions associated with capital equipment and infrastructure

Magnitude of Impact ¹	Change in GHG emissions of WCSB oil sands crudes relative to reference crudes		
	Increase	Decrease	Uncertain
Medium	<ul style="list-style-type: none"> • Including land use changes • Including methane emissions from mining tailings ponds • Assuming electricity exported from oil sands facilities offsets low GHG-intensity electricity generation (i.e., natural gas instead of coal) 	<ul style="list-style-type: none"> • Comparing oil sands derived crude with a relatively low SOR • For SCO: Including the effect that upgrading SCO has on downstream GHG emissions at the refinery 	<ul style="list-style-type: none"> • Accounting for carbon flows associated with land use change of reclaimed land
Small	<ul style="list-style-type: none"> • Including methane emissions from mine face 	<ul style="list-style-type: none"> • Including transportation emissions associated with co-products 	<ul style="list-style-type: none"> • Accounting for actual crude distance traveled and mode of transportation, including domestic transportation from oil field to port • Including fugitive emissions from all processing facilities

¹ Large = greater than approximately 3 percentage point change in WTW emissions. Medium = approximately 1 to 3 percentage point change in WTW emissions. Small = less than approximately 1 percentage point change in WTW emissions.

GHG = greenhouse gas, SCO = synthetic crude oil, WCSB = Western Canadian Sedimentary Basin, WTW = well-to-wheels.

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APPENDIX X

Canadian Environmental Assessment Act

Canadian Regulatory Review of Keystone XL

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CANADA

CONSOLIDATION

CODIFICATION

Canadian Environmental Assessment Act

Loi canadienne sur l'évaluation environnementale

S.C., 1992, c. 37

L.C., 1992, ch. 37

Current to August 12, 2009

À jour au 12 août 2009

Published by the Minister of Justice at the following address:
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OFFICIAL STATUS
OF CONSOLIDATIONS

CARACTÈRE OFFICIEL
DES CODIFICATIONS

Subsections 31(1) and (2) of the *Legislation Revision and Consolidation Act*, in force on June 1, 2009, provide as follows:

Les paragraphes 31(1) et (2) de la *Loi sur la révision et la codification des textes législatifs*, en vigueur le 1^{er} juin 2009, prévoient ce qui suit :

Published
consolidation is
evidence

31. (1) Every copy of a consolidated statute or consolidated regulation published by the Minister under this Act in either print or electronic form is evidence of that statute or regulation and of its contents and every copy purporting to be published by the Minister is deemed to be so published, unless the contrary is shown.

31. (1) Tout exemplaire d'une loi codifiée ou d'un règlement codifié, publié par le ministre en vertu de la présente loi sur support papier ou sur support électronique, fait foi de cette loi ou de ce règlement et de son contenu. Tout exemplaire donné comme publié par le ministre est réputé avoir été ainsi publié, sauf preuve contraire.

Codifications
comme élément
de preuve

Inconsistencies
in Acts

(2) In the event of an inconsistency between a consolidated statute published by the Minister under this Act and the original statute or a subsequent amendment as certified by the Clerk of the Parliaments under the *Publication of Statutes Act*, the original statute or amendment prevails to the extent of the inconsistency.

(2) Les dispositions de la loi d'origine avec ses modifications subséquentes par le greffier des Parlements en vertu de la *Loi sur la publication des lois* l'emportent sur les dispositions incompatibles de la loi codifiée publiée par le ministre en vertu de la présente loi.

Incompatibilité
— lois



1992, c. 37

An Act to establish a federal environmental assessment process

[Assented to 23rd June 1992]

Preamble

WHEREAS the Government of Canada seeks to achieve sustainable development by conserving and enhancing environmental quality and by encouraging and promoting economic development that conserves and enhances environmental quality;

WHEREAS environmental assessment provides an effective means of integrating environmental factors into planning and decision-making processes in a manner that promotes sustainable development;

WHEREAS the Government of Canada is committed to exercising leadership within Canada and internationally in anticipating and preventing the degradation of environmental quality and at the same time ensuring that economic development is compatible with the high value Canadians place on environmental quality;

AND WHEREAS the Government of Canada is committed to facilitating public participation in the environmental assessment of projects to be carried out by or with the approval or assistance of the Government of Canada and providing access to the information on which those environmental assessments are based;

NOW, THEREFORE, Her Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:

1992, ch. 37

Loi de mise en oeuvre du processus fédéral d'évaluation environnementale

[Sanctionnée le 23 juin 1992]

Préambule

Attendu :

que le gouvernement fédéral vise au développement durable par des actions de conservation et d'amélioration de la qualité de l'environnement ainsi que de promotion d'une croissance économique de nature à contribuer à la réalisation de ces fins;

que l'évaluation environnementale constitue un outil efficace pour la prise en compte des facteurs environnementaux dans les processus de planification et de décision, de façon à promouvoir un développement durable;

que le gouvernement fédéral s'engage à jouer un rôle moteur tant au plan national qu'au plan international dans la prévention de la dégradation de l'environnement tout en veillant à ce que les activités de développement économique soient compatibles avec la grande valeur qu'accordent les Canadiens à l'environnement;

que le gouvernement fédéral s'engage à favoriser la participation de la population à l'évaluation environnementale des projets à entreprendre par lui ou approuvés ou aidés par lui, ainsi qu'à fournir l'accès à l'information sur laquelle se fonde cette évaluation,

Sa Majesté, sur l'avis et avec le consentement du Sénat et de la Chambre des communes du Canada, édicte :

SHORT TITLE

Short title **1.** This Act may be cited as the *Canadian Environmental Assessment Act*.

INTERPRETATION

Definitions **2.** (1) In this Act,

“Agency”
« Agence » “Agency” means the Canadian Environmental Assessment Agency established by section 61;

“assessment by a review panel”
« examen par une commission » “assessment by a review panel” means an environmental assessment that is conducted by a review panel established pursuant to section 33 and that includes a consideration of the factors required to be considered under subsections 16(1) and (2);

“comprehensive study”
« étude approfondie » “comprehensive study” means an environmental assessment that is conducted pursuant to sections 21 and 21.1, and that includes a consideration of the factors required to be considered pursuant to subsections 16(1) and (2);

“comprehensive study list”
« liste d’étude approfondie » “comprehensive study list” means a list of all projects or classes of projects that have been prescribed pursuant to regulations made under paragraph 59(d);

“environment”
« environnement » “environment” means the components of the Earth, and includes

(a) land, water and air, including all layers of the atmosphere,

(b) all organic and inorganic matter and living organisms, and

(c) the interacting natural systems that include components referred to in paragraphs (a) and (b);

“environmental assessment”
« évaluation environnementale » “environmental assessment” means, in respect of a project, an assessment of the environmental effects of the project that is conducted in accordance with this Act and the regulations;

“environmental effect”
« effets environnementaux » “environmental effect” means, in respect of a project,

(a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act*,

(b) any effect of any change referred to in paragraph (a) on

TITRE ABRÉGÉ

1. *Loi canadienne sur l’évaluation environnementale*.

DÉFINITIONS

2. (1) Les définitions qui suivent s’appliquent à la présente loi.

« Agence » L’Agence canadienne d’évaluation environnementale constituée par l’article 61.

« autorité fédérale »

a) Ministre fédéral;

b) agence fédérale, société d’État mère au sens du paragraphe 83(1) de la *Loi sur la gestion des finances publiques* ou autre organisme constitué sous le régime d’une loi fédérale et tenu de rendre compte au Parlement de ses activités par l’intermédiaire d’un ministre fédéral;

c) ministère ou établissement public mentionnés aux annexes I et II de la *Loi sur la gestion des finances publiques*;

d) tout autre organisme désigné par les règlements d’application de l’alinéa 59e).

Sont exclus le conseil exécutif et les ministres du Yukon, des Territoires du Nord-Ouest et du Nunavut, ainsi que les ministères et les organismes de l’administration publique de ces territoires, tout conseil de bande au sens donné à « conseil de la bande » dans la *Loi sur les Indiens*, Exportation et développement Canada, l’Office d’investissement du régime de pensions du Canada, les sociétés d’État qui sont des filiales à cent pour cent au sens du paragraphe 83(1) de la *Loi sur la gestion des finances publiques*, les commissions portuaires constituées par la *Loi sur les commissions portuaires*, les commissaires nommés en vertu de la *Loi des commissaires du havre de Hamilton*, la société sans but lucratif qui a conclu une entente en vertu du paragraphe 80(5) de la *Loi maritime du Canada* et les administrations portuaires constituées sous le régime de cette loi.

« autorité responsable » L’autorité fédérale qui, en conformité avec le paragraphe 11(1), est tenue de veiller à ce qu’il soit procédé à l’évaluation environnementale d’un projet.

Titre abrégé

Définitions

« Agence »
“Agency”

« autorité
fédérale »
“federal
authority”

« autorité
responsable »
“responsible
authority”

- (i) health and socio-economic conditions,
- (ii) physical and cultural heritage,
- (iii) the current use of lands and resources for traditional purposes by aboriginal persons, or
- (iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or
- (c) any change to the project that may be caused by the environment,

whether any such change or effect occurs within or outside Canada;

“exclusion list”
« liste
d’exclusion »

“exclusion list” means a list of projects or classes of projects that have been exempted from the requirement to conduct an assessment by regulations made under paragraph 59(c) or (c.1);

“federal
authority”
« autorité
fédérale »

“federal authority” means

- (a) a Minister of the Crown in right of Canada,
- (b) an agency of the Government of Canada, a parent Crown corporation, as defined in subsection 83(1) of the *Financial Administration Act*, or any other body established by or pursuant to an Act of Parliament that is ultimately accountable through a Minister of the Crown in right of Canada to Parliament for the conduct of its affairs,
- (c) any department or departmental corporation set out in Schedule I or II to the *Financial Administration Act*, and
- (d) any other body that is prescribed pursuant to regulations made under paragraph 59(e),

but does not include the Executive Council of — or a minister, department, agency or body of the government of — Yukon, the Northwest Territories or Nunavut, a council of the band within the meaning of the *Indian Act*, Export Development Canada, the Canada Pension Plan Investment Board, a Crown corporation that is a wholly-owned subsidiary, as defined in subsection 83(1) of the *Financial Administration Act*, The Hamilton Harbour Commissioners as constituted pursuant to *The Hamilton Harbour Commissioners’ Act*, a harbour commission established pursuant to the *Harbour Commissions Act*, a not-for-profit corporation that enters into

« développement durable » Développement qui permet de répondre aux besoins du présent sans compromettre la possibilité pour les générations futures de satisfaire les leurs.

« développement durable »
“sustainable development”

« document » Tous éléments d’information, quels que soient leur forme et leur support, notamment correspondance, note, livre, plan, carte, dessin, diagramme, illustration ou graphique, photographie, film, microformule, enregistrement sonore, magnétoscopique ou informatisé, ou toute reproduction de ces éléments d’information.

« document »
“record”

« effets environnementaux » Que ce soit au Canada ou à l’étranger, les changements que la réalisation d’un projet risque de causer à l’environnement — notamment à une espèce sauvage inscrite, à son habitat essentiel ou à la résidence des individus de cette espèce, au sens du paragraphe 2(1) de la *Loi sur les espèces en péril* — les répercussions de ces changements soit en matière sanitaire et socioéconomique, soit sur l’usage courant de terres et de ressources à des fins traditionnelles par les autochtones, soit sur une construction, un emplacement ou une chose d’importance en matière historique, archéologique, paléontologique ou architecturale, ainsi que les changements susceptibles d’être apportés au projet du fait de l’environnement.

« effets environnementaux »
“environmental effect”

« environnement » Ensemble des conditions et des éléments naturels de la Terre, notamment :

« environne-
ment »
“environment”

- a) le sol, l’eau et l’air, y compris toutes les couches de l’atmosphère;
- b) toutes les matières organiques et inorganiques ainsi que les êtres vivants;
- c) les systèmes naturels en interaction qui comprennent les éléments visés aux alinéas a) et b).

« étude approfondie » Évaluation environnementale d’un projet effectuée aux termes des articles 21 et 21.1 et qui comprend la prise en compte des éléments énumérés aux paragraphes 16(1) et (2).

« étude approfondie »
“comprehensive study”

« évaluation environnementale » Évaluation des effets environnementaux d’un projet effectuée conformément à la présente loi et aux règlements.

« évaluation environnementale »
“environmental assessment”

	an agreement under subsection 80(5) of the <i>Canada Marine Act</i> or a port authority established under that Act;	« examen par une commission » Évaluation environnementale effectuée par une commission d'évaluation environnementale constituée aux termes de l'article 33 et qui comprend la prise en compte des éléments énumérés aux paragraphes 16(1) et (2).	« examen par une commission » "assessment by a review panel"
"federal lands" « territoire domanial »	<p>"federal lands" means</p> <p>(a) lands that belong to Her Majesty in right of Canada, or that Her Majesty in right of Canada has the power to dispose of, and all waters on and airspace above those lands, other than lands under the administration and control of the Commissioner of Yukon, the Northwest Territories or Nunavut,</p> <p>(b) the following lands and areas, namely,</p> <p>(i) the internal waters of Canada,</p> <p>(ii) the territorial sea of Canada,</p> <p>(iii) the exclusive economic zone of Canada, and</p> <p>(iv) the continental shelf of Canada, and</p> <p>(c) reserves, surrendered lands and any other lands that are set apart for the use and benefit of a band and are subject to the <i>Indian Act</i>, and all waters on and airspace above those reserves or lands;</p>	<p>« examen préalable » Évaluation environnementale qui, à la fois :</p> <p>a) est effectuée de la façon prévue à l'article 18;</p> <p>b) prend en compte les éléments énumérés au paragraphe 16(1).</p> <p>« liste d'étude approfondie » Liste des projets ou catégories de projets désignés par règlement aux termes de l'alinéa 59 d).</p> <p>« liste d'exclusion » Liste des projets ou catégories de projets soustraits à l'évaluation par règlement pris en vertu des alinéas 59c) ou c.1).</p> <p>« médiation » Évaluation environnementale effectuée sous la direction d'un médiateur nommé aux termes de l'article 30 et qui comprend la prise en compte des éléments énumérés aux paragraphes 16(1) et (2).</p>	<p>« examen préalable » "screening"</p> <p>« liste d'étude approfondie » "comprehensive study list"</p> <p>« liste d'exclusion » "exclusion list"</p> <p>« médiation » "mediation"</p>
"follow-up program" « programme de suivi »	<p>"follow-up program" means a program for</p> <p>(a) verifying the accuracy of the environmental assessment of a project, and</p> <p>(b) determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project;</p>	<p>« mesures d'atténuation » Maîtrise efficace, réduction importante ou élimination des effets environnementaux négatifs d'un projet, éventuellement assortie d'actions de rétablissement notamment par remplacement ou restauration; y est assimilée l'indemnisation des dommages causés.</p>	« mesures d'atténuation » "mitigation"
"interested party" « partie intéressée »	"interested party" means, in respect of an environmental assessment, any person or body having an interest in the outcome of the environmental assessment for a purpose that is neither frivolous nor vexatious;	« ministre » Le ministre de l'Environnement.	« ministre » "Minister"
"mediation" « médiation »	"mediation" means an environmental assessment that is conducted with the assistance of a mediator appointed pursuant to section 30 and that includes a consideration of the factors required to be considered under subsections 16(1) and (2);	« partie intéressée » Toute personne ou tout organisme pour qui le résultat de l'évaluation environnementale revêt un intérêt qui ne soit ni frivole ni vexatoire.	« partie intéressée » "interested party"
"Minister" « ministre »	"Minister" means the Minister of the Environment;	« programme de suivi » Programme visant à permettre :	« programme de suivi » "follow-up program"
"mitigation" « mesures d'atténuation »	"mitigation" means, in respect of a project, the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through re-	<p>a) de vérifier la justesse de l'évaluation environnementale d'un projet;</p> <p>b) de juger de l'efficacité des mesures d'atténuation des effets environnementaux négatifs.</p> <p>« projet » Réalisation — y compris l'exploitation, la modification, la désaffectation ou la fermeture — d'un ouvrage ou proposition d'exercice d'une activité concrète, non liée à un ouvrage, désignée par règlement ou faisant par-</p>	« projet » "project"

	placement, restoration, compensation or any other means;	tie d'une catégorie d'activités concrètes désignée par règlement aux termes de l'alinéa 59b).	
"prescribed" Version anglaise seulement	"prescribed" means prescribed by the regulations;	« promoteur » Autorité fédérale ou gouvernement, personne physique ou morale ou tout organisme qui propose un projet.	« promoteur » "proponent"
"project" « projet »	"project" means (a) in relation to a physical work, any proposed construction, operation, modification, decommissioning, abandonment or other undertaking in relation to that physical work, or (b) any proposed physical activity not relating to a physical work that is prescribed or is within a class of physical activities that is prescribed pursuant to regulations made under paragraph 59(b);	« rapport d'examen préalable » Rapport des résultats d'un examen préalable.	« rapport d'examen préalable » "screening report"
		« registre » Le registre canadien d'évaluation environnementale établi au titre de l'article 55.	« registre » "Registry"
		« territoire domanial » a) Les terres qui appartiennent à Sa Majesté du chef du Canada ou qu'elle a le pouvoir d'aliéner, ainsi que leurs eaux et leur espace aérien, à l'exception des terres dont le Commissaire du Yukon, celui des Territoires du Nord-Ouest ou celui du Nunavut a la gestion et la maîtrise; b) les eaux intérieures, la mer territoriale, la zone économique exclusive et le plateau continental du Canada; c) les réserves, terres cédées ou autres terres qui ont été mises de côté à l'usage et au profit d'une bande et assujetties à la <i>Loi sur les Indiens</i> , ainsi que leurs eaux et leur espace aérien.	« territoire domanial » "federal lands"
"proponent" « promoteur »	"proponent", in respect of a project, means the person, body, federal authority or government that proposes the project;		
"record" « document »	"record" includes any correspondence, memorandum, book, plan, map, drawing, diagram, pictorial or graphic work, photograph, film, microform, sound recording, videotape, machine readable record, and any other documentary material, regardless of physical form or characteristics, and any copy thereof;		
"Registry" « registre »	"Registry" means the Canadian Environmental Assessment Registry established under section 55;		
"responsible authority" « autorité responsable »	"responsible authority", in relation to a project, means a federal authority that is required pursuant to subsection 11(1) to ensure that an environmental assessment of the project is conducted;		
"screening" « examen préalable »	"screening" means an environmental assessment that is conducted pursuant to section 18 and that includes a consideration of the factors set out in subsection 16(1);		
"screening report" « rapport d'examen préalable »	"screening report" means a report that summarizes the results of a screening;		
"sustainable development" « développement durable »	"sustainable development" means development that meets the needs of the present, without compromising the ability of future generations to meet their own needs.		
Extended meaning of "administration of federal lands"	(2) In so far as this Act applies to Crown corporations, the expression "administration of federal lands" includes the ownership or management of those lands.	(2) Dans l'application de la présente loi aux sociétés d'État, la mention de la gestion du territoire domanial vaut mention de l'administra-	Gestion du territoire domanial

For greater
certainty

(3) For greater certainty, any construction, operation, modification, decommissioning, abandonment or other undertaking in relation to a physical work and any activity that is prescribed or is within a class of activities that is prescribed for the purposes of the definition “project” in subsection (1) is a project for at least so long as, in relation to it, a person or body referred to in subsection 5(1) or (2), 8(1), 9(2), 9.1(2), 10(1) or 10.1(2) is considering, but has not yet taken, an action referred to in those subsections.

1992, c. 37, s. 2; 1993, c. 28, s. 78, c. 34, s. 18(F); 1996, c. 31, s. 61; 1998, c. 10, s. 164, c. 15, s. 50; 2002, c. 7, s. 122, c. 29, s. 137; 2003, c. 9, s. 1.

HER MAJESTY

Binding on Her
Majesty

3. This Act is binding on Her Majesty in right of Canada or a province.

PURPOSES

Purposes

4. (1) The purposes of this Act are

(a) to ensure that projects are considered in a careful and precautionary manner before federal authorities take action in connection with them, in order to ensure that such projects do not cause significant adverse environmental effects;

(b) to encourage responsible authorities to take actions that promote sustainable development and thereby achieve or maintain a healthy environment and a healthy economy;

(b.1) to ensure that responsible authorities carry out their responsibilities in a coordinated manner with a view to eliminating unnecessary duplication in the environmental assessment process;

(b.2) to promote cooperation and coordinated action between federal and provincial governments with respect to environmental assessment processes for projects;

(b.3) to promote communication and cooperation between responsible authorities and Aboriginal peoples with respect to environmental assessment;

(c) to ensure that projects that are to be carried out in Canada or on federal lands do not cause significant adverse environmental ef-

tion du territoire domanial ou du fait d’en être propriétaire.

(3) Il est entendu que la réalisation — y compris l’exploitation, la modification, la désaffectation ou la fermeture — d’un ouvrage, ou l’exercice d’une activité désignée par règlement ou faisant partie d’une catégorie d’activités désignée par règlement pour l’application de la définition de « projet » au paragraphe (1), constituent un projet, au minimum, tant qu’une personne ou un organisme visés aux paragraphes 5(1) ou (2), 8(1), 9(2), 9.1(2), 10(1) ou 10.1(2) envisage mais n’a pas encore pris une mesure prévue à ces dispositions.

1992, ch. 37, art. 2; 1993, ch. 28, art. 78, ch. 34, art. 18(F); 1996, ch. 31, art. 61; 1998, ch. 10, art. 164, ch. 15, art. 50; 2002, ch. 7, art. 122, ch. 29, art. 137; 2003, ch. 9, art. 1.

SA MAJESTÉ

Précision

3. La présente loi lie Sa Majesté du chef du Canada ou d’une province.

Sa Majesté

OBJET

Objet

4. (1) La présente loi a pour objet :

a) de veiller à ce que les projets soient étudiés avec soin et prudence avant que les autorités fédérales prennent des mesures à leur égard, afin qu’ils n’entraînent pas d’effets environnementaux négatifs importants;

b) d’inciter ces autorités à favoriser un développement durable propice à la salubrité de l’environnement et à la santé de l’économie;

b.1) de faire en sorte que les autorités responsables s’acquittent de leurs obligations afin d’éviter tout double emploi dans le processus d’évaluation environnementale;

b.2) de promouvoir la collaboration des gouvernements fédéral et provinciaux, et la coordination de leurs activités, dans le cadre du processus d’évaluation environnementale de projets;

b.3) de promouvoir la communication et la collaboration entre les autorités responsables et les peuples autochtones en matière d’évaluation environnementale;

c) de faire en sorte que les éventuels effets environnementaux négatifs importants des projets devant être réalisés dans les limites du Canada ou du territoire domanial ne débordent pas ces limites;

fects outside the jurisdictions in which the projects are carried out; and

(d) to ensure that there be opportunities for timely and meaningful public participation throughout the environmental assessment process.

Duties of the
Government of
Canada

(2) In the administration of this Act, the Government of Canada, the Minister, the Agency and all bodies subject to the provisions of this Act, including federal authorities and responsible authorities, shall exercise their powers in a manner that protects the environment and human health and applies the precautionary principle.

1992, c. 37, s. 4; 1993, c. 34, s. 19(F); 1994, c. 46, s. 1; 2003, c. 9, s. 2.

ENVIRONMENTAL ASSESSMENT OF PROJECTS

PROJECTS TO BE ASSESSED

Projects
requiring
environmental
assessment

5. (1) An environmental assessment of a project is required before a federal authority exercises one of the following powers or performs one of the following duties or functions in respect of a project, namely, where a federal authority

(a) is the proponent of the project and does any act or thing that commits the federal authority to carrying out the project in whole or in part;

(b) makes or authorizes payments or provides a guarantee for a loan or any other form of financial assistance to the proponent for the purpose of enabling the project to be carried out in whole or in part, except where the financial assistance is in the form of any reduction, avoidance, deferral, removal, refund, remission or other form of relief from the payment of any tax, duty or impost imposed under any Act of Parliament, unless that financial assistance is provided for the purpose of enabling an individual project specifically named in the Act, regulation or order that provides the relief to be carried out;

(c) has the administration of federal lands and sells, leases or otherwise disposes of those lands or any interests in those lands, or transfers the administration and control of those lands or interests to Her Majesty in

d) de veiller à ce que le public ait la possibilité de participer de façon significative et en temps opportun au processus de l'évaluation environnementale.

Mission du
gouvernement
du Canada

(2) Pour l'application de la présente loi, le gouvernement du Canada, le ministre, l'Agence et les organismes assujettis aux dispositions de celle-ci, y compris les autorités fédérales et les autorités responsables, doivent exercer leurs pouvoirs de manière à protéger l'environnement et la santé humaine et à appliquer le principe de la prudence.

1992, ch. 37, art. 4; 1993, ch. 34, art. 19(F); 1994, ch. 46, art. 1; 2003, ch. 9, art. 2.

ÉVALUATION ENVIRONNEMENTALE DES PROJETS

PROJETS VISÉS

Projets visés

5. (1) L'évaluation environnementale d'un projet est effectuée avant l'exercice d'une des attributions suivantes :

a) une autorité fédérale en est le promoteur et le met en oeuvre en tout ou en partie;

b) une autorité fédérale accorde à un promoteur en vue de l'aider à mettre en oeuvre le projet en tout ou en partie un financement, une garantie d'emprunt ou toute autre aide financière, sauf si l'aide financière est accordée sous forme d'allègement — notamment réduction, évitement, report, remboursement, annulation ou remise — d'une taxe ou d'un impôt qui est prévu sous le régime d'une loi fédérale, à moins que cette aide soit accordée en vue de permettre la mise en oeuvre d'un projet particulier spécifié nommément dans la loi, le règlement ou le décret prévoyant l'allègement;

c) une autorité fédérale administre le territoire domanial et en autorise la cession, notamment par vente ou cession à bail, ou celle de tout droit foncier relatif à celui-ci ou en transfère à Sa Majesté du chef d'une province l'administration et le contrôle, en vue de la mise en oeuvre du projet en tout ou en partie;

d) une autorité fédérale, aux termes d'une disposition prévue par règlement pris en vertu de l'alinéa 59f), délivre un permis ou une

right of a province, for the purpose of enabling the project to be carried out in whole or in part; or

(d) under a provision prescribed pursuant to paragraph 59(f), issues a permit or licence, grants an approval or takes any other action for the purpose of enabling the project to be carried out in whole or in part.

(2) Notwithstanding any other provision of this Act,

(a) an environmental assessment of a project is required before the Governor in Council, under a provision prescribed pursuant to regulations made under paragraph 59(g), issues a permit or licence, grants an approval or takes any other action for the purpose of enabling the project to be carried out in whole or in part; and

(b) the federal authority that, directly or through a Minister of the Crown in right of Canada, recommends that the Governor in Council take an action referred to in paragraph (a) in relation to that project

(i) shall ensure that an environmental assessment of the project is conducted as early as is practicable in the planning stages of the project and before irrevocable decisions are made,

(ii) is, for the purposes of this Act and the regulations, except subsection 11(2) and sections 20 and 37, the responsible authority in relation to the project,

(iii) shall consider the applicable reports and comments referred to in sections 20 and 37, and

(iv) where applicable, shall perform the duties of the responsible authority in relation to the project under section 38 as if it were the responsible authority in relation to the project for the purposes of paragraphs 20(1)(a) and 37(1)(a).

6. Notwithstanding any other provision of this Act, no confidence of the Queen's Privy Council for Canada in respect of which subsection 39(1) of the *Canada Evidence Act* applies shall be disclosed or made available to any person.

licence, donne toute autorisation ou prend toute mesure en vue de permettre la mise en oeuvre du projet en tout ou en partie.

(2) Par dérogation à toute autre disposition de la présente loi :

a) l'évaluation environnementale d'un projet est obligatoire, avant que le gouverneur en conseil, en vertu d'une disposition désignée par règlement aux termes de l'alinéa 59g), prenne une mesure, notamment délivre un permis ou une licence ou accorde une approbation, autorisant la réalisation du projet en tout ou en partie;

b) l'autorité fédérale qui, directement ou par l'intermédiaire d'un ministre fédéral, recommande au gouverneur en conseil la prise d'une mesure visée à l'alinéa a) à l'égard du projet :

(i) est tenue de veiller à ce que l'évaluation environnementale du projet soit effectuée le plus tôt possible au stade de la planification de celui-ci, avant la prise d'une décision irrévocable,

(ii) est l'autorité responsable à l'égard du projet pour l'application de la présente loi — à l'exception du paragraphe 11(2) et des articles 20 et 37 — et de ses règlements,

(iii) est tenue de prendre en compte les rapports et observations pertinents visés aux articles 20 et 37,

(iv) le cas échéant, est tenue d'exercer à l'égard du projet les attributions de l'autorité responsable prévues à l'article 38 comme si celle-ci était l'autorité responsable à l'égard du projet pour l'application des alinéas 20(1)a) et 37(1)a).

6. Par dérogation à toute autre disposition de la présente loi, nul renseignement confidentiel du Conseil privé de la Reine pour le Canada visé par le paragraphe 39(1) de la *Loi sur la preuve au Canada* ne peut être divulgué ni fourni à quiconque.

Projects requiring approval of Governor in Council

Projets nécessitant l'approbation du gouverneur en conseil

Confidences of Queen's Privy Council for Canada

Renseignements confidentiels

EXCLUDED PROJECTS

EXCLUSIONS

Exclusions

7. (1) An assessment of a project is not required under section 5 or sections 8 to 10.1, where

- (a) the project is described in an exclusion list;
- (b) the project is to be carried out in response to a national emergency for which special temporary measures are being taken under the *Emergencies Act*; or
- (c) the project is to be carried out in response to an emergency and carrying out the project forthwith is in the interest of preventing damage to property or the environment or is in the interest of public health or safety.

Exclusions

(2) For greater certainty, an assessment is not required under any of the provisions referred to in this subsection where a federal authority exercises a power or performs a duty or function referred to in paragraph 5(1)(b) or 10.1(2)(b) — or a person or body exercises a power or performs a duty or function referred to in paragraph 5(1)(b), 9(2)(b), 9.1(2)(b) or 10(1)(b) — in relation to a project and the essential details of the project are not specified before or at the time the power is exercised or the duty or function is performed.

1992, c. 37, s. 7; 1994, c. 26, s. 23(F); 2003, c. 9, s. 3.

Assessments by certain Crown corporations

8. (1) A Crown corporation, as defined in subsection 83(1) of the *Financial Administration Act*, that is not a federal authority shall, if regulations have been made in relation to it under paragraph 59(j) and have come into force, ensure that, before it exercises a power or performs a duty or function referred to in any of paragraphs 5(1)(a) to (d) in relation to a project, an environmental assessment of the project under this section is conducted in accordance with those regulations as early as is practicable in the planning stages of the project and before irrevocable decisions are made.

Where a minister has no duty

(2) Notwithstanding section 5, a Minister of the Crown in right of Canada is not required to ensure that an environmental assessment of a project is conducted by reason only of that minister's authorization or approval under any other Act of Parliament or any regulations made under such an Act of the exercise of a power or performance of a duty or function referred to in paragraph 5(1)(a), (b) or (c) in relation to the

7. (1) N'ont pas à faire l'objet d'une évaluation en application des articles 5 ou 8 à 10.1 les projets :

- a) qui sont visés dans les listes d'exclusion;
- b) qui sont mis en oeuvre en réaction à des situations de crise nationale pour lesquelles des mesures d'intervention sont prises aux termes de la *Loi sur les mesures d'urgence*;
- c) qui sont mis en oeuvre en réaction à une situation d'urgence et qu'il importe, soit pour la protection de biens ou de l'environnement, soit pour la santé ou la sécurité publiques, de mettre en oeuvre sans délai.

Exclusions

(2) Il est entendu que l'évaluation n'est pas nécessaire dans les cas où l'autorité fédérale exerce une attribution visée aux alinéas 5(1)b) ou 10.1(2)b) — ou une personne ou un organisme exerce une attribution visée à l'un ou l'autre des alinéas 5(1)b), 9(2)b), 9.1(2)b) ou 10(1)b) — à l'égard d'un projet dont les détails essentiels ne sont pas déterminés au moment de l'exercice de cette attribution.

1992, ch. 37, art. 7; 1994, ch. 26, art. 23(F); 2003, ch. 9, art. 3.

Précision

8. (1) À compter de l'entrée en vigueur des règlements pris à son égard en vertu de l'alinéa 59j), toute société d'État, au sens du paragraphe 83(1) de la *Loi sur la gestion des finances publiques*, qui n'est pas une autorité fédérale veille, avant d'exercer une attribution visée à l'un ou l'autre des alinéas 5(1)a) à d) à l'égard d'un projet, à ce qu'une évaluation environnementale du projet soit effectuée conformément à ces règlements, le plus tôt possible au stade de la planification du projet et avant la prise d'une décision irrévocable.

Évaluations par certaines sociétés d'État

(2) Malgré l'article 5, un ministre fédéral n'est pas tenu de veiller à ce que l'évaluation environnementale d'un projet soit effectuée uniquement parce qu'il autorise ou approuve, en vertu d'une autre loi fédérale ou de ses règlements, l'exercice par une société d'État, au sens de la *Loi sur la gestion des finances publiques*, d'une attribution visée aux alinéas 5(1)a), b) ou c) à l'égard du projet.

Absence d'obligation du ministre

project by a Crown corporation within the meaning of the *Financial Administration Act*.

Precedence of
federal authority

(3) If a Crown corporation is the proponent of a project and proposes to do any act or thing that commits it to carrying out the project in whole or in part and a federal authority other than the Crown corporation is required under paragraph 5(1)(d) to ensure the conduct of an environmental assessment of that project, the Crown corporation is not required to ensure that an environmental assessment of the project is conducted but, for greater certainty, it may accept a delegation from the federal authority under section 17.

1992, c. 37, s. 8; 2003, c. 9, s. 4.

Assessments by
harbour
commissions
and port
authorities

9. (1) The Hamilton Harbour Commissioners as constituted pursuant to *The Hamilton Harbour Commissioners' Act*, a harbour commission established pursuant to the *Harbour Commissions Act*, a not-for-profit corporation that enters into an agreement under subsection 80(5) of the *Canada Marine Act* or a port authority established under that Act shall, if regulations have been made under paragraph 59(k) and have come into force, ensure that an environmental assessment of a project under this section is conducted in accordance with those regulations as early as is practicable in the planning stages of the project and before irrevocable decisions are made.

Projects

(2) The environmental assessment of a project under this section shall be conducted where

(a) a person or body referred to in subsection (1) is the proponent of the project and does any act or thing that commits it to carrying out the project in whole or in part;

(b) a person or body referred to in subsection (1) makes or authorizes payments or provides a guarantee for a loan or any other form of financial assistance to the proponent for the purpose of enabling the project to be carried out in whole or in part;

(c) a person or body referred to in subsection (1) sells, leases or otherwise disposes of federal lands or any interests in those lands, for the purpose of enabling the project to be carried out in whole or in part;

(d) under a provision prescribed under paragraph 59(k.1), a person or body referred to in

(3) La société d'État qui est le promoteur d'un projet et se propose de le mettre en œuvre en tout ou en partie n'est pas tenue de veiller à ce que soit effectuée une évaluation environnementale du projet si une autorité fédérale — autre que la société d'État — doit prendre une mesure prévue à l'alinéa 5(1)d) à l'égard du projet; il est entendu que rien ne l'empêche d'accepter une délégation dans le cadre de l'article 17.

1992, ch. 37, art. 8; 2003, ch. 9, art. 4.

Préséance de
l'autorité
fédérale

Commissions
portuaires et
administrations
portuaires

9. (1) Les commissaires nommés en vertu de la *Loi des commissaires du havre de Hamilton*, les commissions portuaires constituées par la *Loi sur les commissions portuaires*, la société sans but lucratif qui a conclu une entente en vertu du paragraphe 80(5) de la *Loi maritime du Canada* et les administrations portuaires constituées sous le régime de cette loi veillent, à compter de l'entrée en vigueur des règlements pris en vertu de l'alinéa 59k), à ce qu'une évaluation environnementale d'un projet soit effectuée conformément à ces règlements, le plus tôt possible au stade de la planification du projet et avant la prise d'une décision irrévocable.

(2) L'évaluation environnementale d'un projet est effectuée dans les cas suivants :

a) les personnes ou organismes visés au paragraphe (1) en sont le promoteur et le metteur en œuvre, en tout ou en partie;

b) ils accordent au promoteur un financement, une garantie d'emprunt ou toute autre aide financière en vue d'en permettre la mise en œuvre, en tout ou en partie;

c) ils autorisent la cession du territoire domanial, notamment par vente ou cession à bail, ou celle de tout droit foncier relatif à celui-ci, en vue de la mise en œuvre du projet, en tout ou en partie;

d) aux termes d'une disposition visée par règlement pris en vertu de l'alinéa 59k.1), ils délivrent un permis ou une licence, donnent toute autorisation ou prennent toute mesure en vue de permettre la mise en œuvre du projet, en tout ou en partie;

Projets visés

subsection (1) issues a permit or licence, grants an approval or takes any other action for the purpose of enabling the project to be carried out in whole or in part; or

(e) in circumstances prescribed by regulations made under paragraph 59(k.2), a project is to be carried out in whole or in part on federal lands over which a person or body referred to in subsection (1) has administration or management.

1992, c. 37, s. 9; 1998, c. 10, s. 165; 2003, c. 9, s. 5.

Prescribed
authorities

9.1 (1) If regulations have been made under paragraph 59(k.3) and have come into force, an authority prescribed by those regulations shall ensure that an environmental assessment of a project under this section is conducted in accordance with those regulations as early as is practicable in the planning stages of the project and before irrevocable decisions are made.

Projects

(2) The environmental assessment of a project under this section shall be conducted where

(a) the project is to be carried out on federal lands and the prescribed authority is the proponent of the project and does any act or thing that commits it to carrying out the project in whole or in part;

(b) the project is to be carried out on federal lands and the prescribed authority makes or authorizes payments or provides a guarantee for a loan or any other form of financial assistance to the proponent for the purpose of enabling the project to be carried out in whole or in part;

(c) the prescribed authority sells, leases or otherwise disposes of federal lands or any interests in those lands, for the purpose of enabling the project to be carried out in whole or in part;

(d) the prescribed authority, under a provision prescribed under paragraph 59(k.4), issues a permit or licence, grants an approval or takes any other action for the purpose of enabling the project to be carried out in whole or in part; or

(e) in circumstances prescribed by regulations made under paragraph 59(k.5), a project is to be carried out in whole or in part on federal lands over which the prescribed

e) le cas est prévu par règlement pris en vertu de l'alinéa 59k.2) et le projet doit être mis en œuvre, en tout ou en partie, sur le territoire domanial dont ils ont l'administration ou la gestion.

1992, ch. 37, art. 9; 1998, ch. 10, art. 165; 2003, ch. 9, art. 5.

9.1 (1) À compter de l'entrée en vigueur des règlements pris en vertu de l'alinéa 59k.3), toute autorité visée par ceux-ci veille à ce qu'une évaluation environnementale d'un projet soit effectuée conformément à ces règlements, le plus tôt possible au stade de la planification de celui-ci et avant la prise d'une décision irrévocable.

Autorités
prévues par
règlement

(2) L'évaluation environnementale d'un projet est effectuée dans les cas suivants :

Projets visés

a) l'autorité en est le promoteur et le met en œuvre, en tout ou en partie, sur un territoire domanial;

b) elle accorde au promoteur un financement, une garantie d'emprunt ou toute autre aide financière en vue d'en permettre la mise en œuvre, en tout ou en partie, sur le territoire domanial;

c) elle autorise la cession du territoire domanial, notamment par vente ou cession à bail, ou celle de tout droit foncier relatif à celui-ci, en vue de la mise en œuvre du projet, en tout ou en partie;

d) aux termes d'une disposition visée par règlement pris en vertu de l'alinéa 59k.4), elle délivre un permis ou une licence, donne toute autorisation ou prend toute mesure en vue de permettre la mise en œuvre du projet, en tout ou en partie;

e) le cas est prévu par règlement pris en vertu de l'alinéa 59k.5) et le projet doit être mis en œuvre, en tout ou en partie, sur le territoire domanial dont elle a l'administration ou la gestion ou sur lequel elle a un droit ou un intérêt prévus par règlement.

2003, ch. 9, art. 5.

authority has administration or management or any right or interest specified in those regulations.

2003, c. 9, s. 5.

Assessments by
band councils
under
regulations

10. (1) If a project is to be carried out in whole or in part on a reserve that has been set apart for the use and benefit of a band and that is subject to the *Indian Act*, the council of the band for whose use and benefit the reserve has been set apart shall, if regulations that apply to the band have been made under paragraph 59(1) and have come into force, ensure that an environmental assessment of the project is conducted in accordance with those regulations before the band council exercises one of the following powers or performs one of the following duties or functions in respect of the project, namely, where the band council

(a) is the proponent of the project and does any act or thing that commits it to carrying out the project in whole or in part;

(b) makes or authorizes payments or provides a guarantee for a loan or any other form of financial assistance to the proponent of the project for the purpose of enabling the project to be carried out in whole or in part, including financial assistance in the form of any reduction, avoidance, deferral, removal, refund, remission or other form of relief from the payment of any tax; or

(c) takes any action under a provision prescribed under paragraph 59(1.001) for the purpose of enabling the project to be carried out in whole or in part.

Timing of
assessment

(2) Where an environmental assessment of a project is required under subsection (1), the band council shall ensure that the assessment is conducted as early as is practicable in the planning stages of the project and before irrevocable decisions are made.

1992, c. 37, s. 10; 2003, c. 9, s. 5.

Assessments —
CIDA

10.1 (1) The Canadian International Development Agency shall, if regulations have been made under paragraph 59(1.01) and have come into force, ensure that an environmental assessment of a project is conducted under this section in accordance with those regulations as early as is practicable in the planning stages of the project and before irrevocable decisions are made.

10. (1) Le conseil d'une bande assujettie à la *Loi sur les Indiens* veille, à compter de l'entrée en vigueur des règlements pris en vertu de l'alinéa 59(1) à son égard, à ce qu'une évaluation environnementale d'un projet devant être mis en œuvre, en tout ou en partie, sur une réserve mise de côté à l'usage et au profit de cette bande soit effectuée conformément à ces règlements, avant l'exercice de l'une des attributions suivantes :

a) il est le promoteur du projet et le met en œuvre en tout ou en partie;

b) il accorde à un promoteur en vue de l'aider à mettre en œuvre le projet en tout ou en partie un financement, une garantie d'emprunt ou toute autre aide financière, y compris une aide financière accordée sous forme d'allègement — réduction, évitement, report, remboursement, annulation ou remise — d'une taxe;

c) il prend une mesure, au titre d'une disposition prévue par règlement pris en vertu de l'alinéa 59(1.001), en vue de permettre la mise en œuvre du projet en tout ou en partie.

Conseils de
bande

(2) Dans le cas où l'évaluation environnementale d'un projet est obligatoire au titre du paragraphe (1), le conseil de bande veille à ce que celle-ci soit effectuée le plus tôt possible au stade de la planification du projet, avant la prise d'une décision irrévocable.

1992, ch. 37, art. 10; 2003, ch. 9, art. 5.

Moment de
l'évaluation

10.1 (1) L'Agence canadienne de développement international veille, à compter de l'entrée en vigueur du règlement pris en vertu de l'alinéa 59(1.01), à ce qu'une évaluation environnementale d'un projet soit effectuée conformément à ces règlements, le plus tôt possible au stade de la planification de celui-ci et avant la prise d'une décision irrévocable.

ACDI

Projects	<p>(2) An environmental assessment of a project under this section is required to be conducted where the Canadian International Development Agency</p> <p>(a) is the proponent of the project and does any act or thing that commits it to carrying out the project in whole or in part; or</p> <p>(b) makes or authorizes payments or provides a guarantee for a loan or any other form of financial assistance for the purpose of enabling the project to be carried out in whole or in part.</p>	<p>(2) L'évaluation environnementale d'un projet est effectuée dans les cas où l'Agence canadienne de développement international :</p> <p>a) en est le promoteur et le met en œuvre, en tout ou en partie;</p> <p>b) accorde un financement, une garantie d'emprunt ou toute autre aide financière en vue d'en permettre la mise en œuvre, en tout ou en partie.</p>	Projets visés
Replacement for environmental assessment	<p>(3) The application of subsection 5(1) to the Canadian International Development Agency is suspended while regulations referred to in subsection (1) are in force.</p> <p>2003, c. 9, s. 5.</p>	<p>(3) L'application du paragraphe 5(1) à l'Agence canadienne de développement international est suspendue, de l'entrée en vigueur du règlement visé au paragraphe (1) à son abrogation.</p> <p>2003, ch. 9, art. 5.</p>	Suspension d'application du par. 5(1)
<div>RESPONSIBLE AUTHORITY</div> <div>AUTORITÉ RESPONSABLE</div>			
Timing of assessment	<p>11. (1) Where an environmental assessment of a project is required, the federal authority referred to in section 5 in relation to the project shall ensure that the environmental assessment is conducted as early as is practicable in the planning stages of the project and before irrevocable decisions are made, and shall be referred to in this Act as the responsible authority in relation to the project.</p>	<p>11. (1) Dans le cas où l'évaluation environnementale d'un projet est obligatoire, l'autorité fédérale visée à l'article 5 veille à ce que l'évaluation environnementale soit effectuée le plus tôt possible au stade de la planification du projet, avant la prise d'une décision irrévocable, et est appelée, dans la présente loi, l'autorité responsable de ce projet.</p>	Moment de l'évaluation
No power, etc., to be exercised until assessment is complete	<p>(2) A responsible authority shall not exercise any power or perform any duty or function referred to in section 5 in relation to a project unless it takes a course of action pursuant to paragraph 20(1)(a) or 37(1)(a).</p>	<p>(2) L'autorité responsable d'un projet ne peut exercer ses attributions à l'égard de celui-ci que si elle prend une décision aux termes des alinéas 20(1)a) ou 37(1)a).</p>	Effet suspensif
Ministerial orders	<p>11.1 (1) The Minister or the minister through whom the responsible authority is accountable to Parliament for the conduct of its affairs in respect of a project being assessed under this Act — or, if there is more than one responsible authority in respect of a project, the ministers together — may, by order, prohibit a proponent from doing, until the day on which the responsible authority or authorities take a course of action under paragraph 20(1)(a) or (b) or subsection 37(1), any act or thing that carries out the project being assessed in whole or in part and that would alter the environment.</p>	<p>11.1 (1) Le ministre ou le ministre qui doit répondre devant le Parlement des activités de l'autorité responsable — ou les ministres agissant conjointement, lorsque plusieurs autorités sont responsables d'un même projet — peut, par arrêté, ordonner au promoteur de s'abstenir de tout acte modifiant l'environnement et permettant la mise en œuvre, même partielle, du projet faisant l'objet de l'évaluation jusqu'à ce que l'autorité ait pris une décision en application des alinéas 20(1)a) ou b) ou du paragraphe 37(1).</p>	Arrêté ministériel
Order in force	<p>(2) An order under subsection (1) takes effect on the day on which it is made.</p>	<p>(2) L'arrêté prend effet dès sa prise.</p>	Prise d'effet de l'arrêté

Approval of Governor in Council	(3) The order ceases to have effect 14 days after it is made unless, within that period, it is approved by the Governor in Council.	(3) L'arrêté devient inopérant à défaut d'approbation par le gouverneur en conseil dans les quatorze jours suivant sa prise.	Approbation par le gouverneur en conseil
Exemption from application of Statutory Instruments Act	(4) The order is exempt from the application of sections 3, 5 and 11 of the <i>Statutory Instruments Act</i> and shall be published in the <i>Canada Gazette</i> within 23 days after it is approved by the Governor in Council. 2003, c. 9, s. 6.	(4) L'arrêté est soustrait à l'application des articles 3, 5 et 11 de la <i>Loi sur les textes réglementaires</i> ; il est publié dans la <i>Gazette du Canada</i> dans les vingt-trois jours suivant son approbation. 2003, ch. 9, art. 6.	Dérogation à la <i>Loi sur les textes réglementaires</i>
Injunction	11.2 (1) If, on the application of the Attorney General of Canada or any interested person, it appears to a court of competent jurisdiction that an order made under section 11.1 has been, is about to be or is likely to be contravened, the court may issue an injunction ordering any person named in the application to refrain from doing any act or thing that would contravene the order, until the day on which the responsible authority or authorities referred to in that section take a course of action under paragraph 20(1)(a) or (b) or subsection 37(1).	11.2 (1) Si, sur demande présentée par le procureur général du Canada ou toute personne intéressée, il conclut à l'inobservation — réelle ou appréhendée — de l'arrêté pris en application de l'article 11.1, le tribunal compétent peut, par injonction, interdire à toute personne visée par la demande d'accomplir tout acte qui contreviendrait à l'arrêté jusqu'à ce que l'autorité responsable ait pris une décision en application des alinéas 20(1)a) ou b) ou du paragraphe 37(1).	Injonction
Notice	(2) At least forty-eight hours before an injunction is issued under subsection (1), notice of the application shall be given to persons named in the application, unless the urgency of the situation is such that the delay involved in giving the notice would not be in the public interest. 2003, c. 9, s. 6.	(2) Sauf lorsque cela serait contraire à l'intérêt public en raison de l'urgence de la situation, l'injonction est subordonnée à la signification d'un préavis d'au moins quarante-huit heures aux parties nommées dans la demande. 2003, ch. 9, art. 6.	Préavis
More than one responsible authority	12. (1) Where there are two or more responsible authorities in relation to a project, they shall together determine the manner in which to perform their duties and functions under this Act and the regulations.	12. (1) Dans le cas où plusieurs autorités responsables sont chargées d'un même projet, elles décident conjointement de la façon de remplir les obligations qui leur incombent aux termes de la présente loi et des règlements.	Pluralité d'autorités responsables
Disagreement	(2) In the case of a disagreement, the Agency may advise responsible authorities and other federal authorities with respect to their powers, duties and functions under this Act and the manner in which those powers, duties and functions may be determined and allocated among them.	(2) En cas de différend, l'Agence peut conseiller les autorités responsables et les autres autorités fédérales sur leurs obligations communes et sur la façon de les remplir conjointement.	Différend
Participation by federal authorities	(3) Every federal authority that is in possession of specialist or expert information or knowledge with respect to a project shall, on request, make available that information or knowledge to the responsible authority or to a mediator or a review panel.	(3) Il incombe à l'autorité fédérale pourvue des connaissances voulues touchant un projet de fournir, sur demande, les renseignements pertinents à l'autorité responsable ou à un médiateur ou à une commission.	Obligation de l'autorité fédérale
Cooperation with other jurisdictions	(4) Where a screening or comprehensive study of a project is to be conducted and a ju-	(4) L'autorité responsable peut, dans le cadre de l'examen préalable ou de l'étude appro-	Collaboration

jurisdiction has a responsibility or an authority to conduct an assessment of the environmental effects of the project or any part thereof, the responsible authority may cooperate with that jurisdiction respecting the environmental assessment of the project.

Definition of
"jurisdiction"

- (5) In this section, "jurisdiction" means
- (a) the government of a province;
 - (b) an agency or a body that is established pursuant to the legislation of a province and that has powers, duties or functions in relation to an assessment of the environmental effects of a project;
 - (c) a body that is established pursuant to a land claims agreement referred to in section 35 of the *Constitution Act, 1982* and that has powers, duties or functions in relation to an assessment of the environmental effects of a project; or
 - (d) a governing body that is established pursuant to legislation that relates to the self-government of Indians and that has powers, duties or functions in relation to an assessment of the environmental effects of a project.

1992, c. 37, s. 12; 1993, c. 34, s. 20(F).

FEDERAL ENVIRONMENTAL ASSESSMENT COORDINATOR

Role

12.1 The role of a federal environmental assessment coordinator is to coordinate the participation of federal authorities in the environmental assessment process for a project where a screening or comprehensive study is or might be required and to facilitate communication and cooperation among them and with provinces, persons or bodies referred to in sections 8 to 10, jurisdictions referred to in paragraph 12(5) (c) or (d) or 40(1)(e) or (f) and other participants.

2003, c. 9, s. 7.

Duties

12.2 The federal environmental assessment coordinator shall

- (a) ensure that the federal authorities that are or may be responsible authorities and those that are or may be in possession of specialist or expert information or knowledge with respect to the project are identified;

fondie d'un projet, coopérer, pour l'évaluation environnementale de celui-ci, avec l'instance qui a la responsabilité ou le pouvoir d'effectuer l'évaluation des effets environnementaux de tout ou partie d'un projet.

(5) Dans le présent article, « instance » s'entend :

- a) du gouvernement d'une province;
- b) d'un organisme établi sous le régime d'une loi provinciale ayant des attributions relatives à l'évaluation des effets environnementaux d'un projet;
- c) d'un organisme, constitué aux termes d'un accord sur des revendications territoriales visé à l'article 35 de la *Loi constitutionnelle de 1982*, ayant des attributions relatives à l'évaluation des effets environnementaux d'un projet;
- d) d'un organisme dirigeant, constitué par une loi relative à l'autonomie gouvernementale des Indiens, ayant des attributions relatives à l'évaluation des effets environnementaux d'un projet.

1992, ch. 37, art. 12; 1993, ch. 34, art. 20(F).

COORDONNATEUR FÉDÉRAL DE L'ÉVALUATION ENVIRONNEMENTALE

Définition d'
« instance »

Rôle

12.1 Le coordonnateur fédéral de l'évaluation environnementale d'un projet est chargé de coordonner la participation des autorités fédérales au processus d'évaluation environnementale pour un projet qui doit ou pourrait faire l'objet d'un examen préalable ou d'une étude approfondie et de faciliter les communications et la collaboration entre elles et avec les autres intervenants, notamment les provinces, les personnes et organismes visés aux articles 8 à 10 et les instances au sens prévu aux alinéas 12(5)c) ou d) ou 40(1)e) ou f).

2003, ch. 9, art. 7.

Obligations

12.2 Le coordonnateur est tenu :

- a) de veiller au recensement des autorités responsables — actuelles ou éventuelles —, de même que des autorités fédérales disposant — effectivement ou éventuellement — de l'expertise ou des connaissances voulues touchant le projet;

- (b) coordinate their involvement throughout the environmental assessment process;
- (c) coordinate the responsible authorities' fulfilment of their obligations under subsection 55.3(1), paragraph 55.4(1)(a) and section 55.5;
- (d) ensure that federal authorities fulfil their obligations under this Act in a timely manner; and
- (e) coordinate the federal authorities' involvement with other jurisdictions.

2003, c. 9, s. 7.

- b) de coordonner leur participation tout au long du processus d'évaluation environnementale;
- c) de coordonner l'exécution, par les autorités responsables, des obligations qui leur incombent en vertu du paragraphe 55.3(1), de l'alinéa 55.4(1)a) et de l'article 55.5;
- d) de veiller à ce que les autorités fédérales s'acquittent des obligations qui leur incombent en vertu de la présente loi en temps opportun;
- e) de coordonner la participation des autorités fédérales avec les autres instances.

2003, ch. 9, art. 7.

Powers

12.3 In carrying out duties under section 12.2, the federal environmental assessment coordinator may

- (a) establish and chair a committee composed of the federal authorities that are or may be responsible authorities for the project and those that are or may be in possession of specialist or expert information or knowledge with respect to the project;
- (b) after consulting with the authorities referred to in paragraph (a), establish time lines in relation to the assessment; and
- (c) in consultation with the federal authorities that are or may be responsible authorities, determine the timing of any public participation.

2003, c. 9, s. 7.

Agency as coordinator

12.4 (1) Subject to subsection (3), the federal environmental assessment coordinator for a project is the Agency if

- (a) the project is subject to the environmental assessment process of another jurisdiction referred to in paragraph 12(5)(a), (c) or (d) or 40(1)(e) or (f); or
- (b) the project is described in the comprehensive study list.

Responsible authority as coordinator

(2) Subject to subsections (1) and (3), the federal environmental assessment coordinator for a project is

- (a) the sole responsible authority in relation to the project; or
- (b) if there is more than one responsible authority in relation to the project, the one that

12.3 Dans l'exercice de ses attributions, le coordonnateur peut :

- a) créer et présider un comité regroupant les autorités responsables — actuelles ou éventuelles — , de même que les autorités fédérales disposant — effectivement ou éventuellement — de l'expertise ou des connaissances voulues touchant le projet;
- b) après avoir consulté les autorités visées à l'alinéa a), établir l'échéancier relatif à l'évaluation;
- c) après avoir consulté les autorités responsables — actuelles ou éventuelles — , prévoir, s'il y a lieu, le moment où la participation du public sera sollicitée.

2003, ch. 9, art. 7.

Pouvoirs

12.4 (1) Sous réserve du paragraphe (3), les attributions de coordonnateur sont exercées par l'Agence dans les cas suivants :

- a) le projet est assujéti au processus d'évaluation environnementale d'une autre instance, au sens des alinéas 12(5)a), c) ou d) ou 40(1)e) ou f);
- b) le projet est visé dans la liste d'étude approfondie.

Attributions exercées par l'Agence

(2) Sous réserve des paragraphes (1) et (3), les attributions de coordonnateur sont exercées :

- a) s'il n'y a qu'une autorité responsable du projet, par celle-ci;
- b) s'il y a plusieurs autorités responsables du projet, par celle qu'elles désignent con-

Attributions exercées par une autorité responsable

	is selected by the responsible authorities or, if they have not selected one within a reasonable time, the one that is designated by the Agency.	jointement ou, si elles ne le font pas dans un délai raisonnable, par celle que l'Agence désigne.	
Coordinator by agreement	<p>(3) No person or body other than the coordinator designated under subsections (1) and (2) may assume any of the powers, duties or functions of the federal environmental assessment coordinator except</p> <p>(a) the Agency, if the responsible authorities referred to in paragraph (2)(b) and the Agency agree; or</p> <p>(b) a responsible authority, in a case referred to in paragraph (1)(a) or (b), if the Agency and the responsible authority agree.</p>	<p>(3) Il ne peut être dérogé aux paragraphes (1) ou (2) que dans les cas suivants :</p> <p>a) les autorités responsables visées à l'alinéa (2)b) conviennent avec l'Agence que celle-ci exercera tout ou partie des attributions de coordonnateur;</p> <p>b) l'Agence convient avec une autorité responsable, dans les cas prévus aux alinéas (1)a) ou b), que cette dernière exercera tout ou partie de ces attributions.</p>	Ententes particulières
For greater certainty	<p>(4) For greater certainty, agreements contemplated by subsection (3) may apply generally and not be specific to a particular project.</p> <p>2003, c. 9, s. 7.</p>	<p>(4) Il est entendu qu'une entente visée au paragraphe (3) peut être générale et ne pas être liée à un projet spécifique.</p> <p>2003, ch. 9, art. 7.</p>	Précision
Obligation to comply with coordinator's requests	<p>12.5 Every federal authority shall comply in a timely manner with requests and determinations made by the federal environmental assessment coordinator in the course of carrying out its duties or functions.</p> <p>2003, c. 9, s. 7.</p>	<p>12.5 Il incombe à toute autorité fédérale de se conformer en temps opportun aux demandes et aux décisions du coordonnateur agissant dans l'exercice de ses attributions.</p> <p>2003, ch. 9, art. 7.</p>	Conformité aux demandes et décisions du coordonnateur
Action suspended	<p>ACTION OF FEDERAL AUTHORITIES SUSPENDED</p> <p>13. Where a project is described in the comprehensive study list or is referred to a mediator or a review panel, notwithstanding any other Act of Parliament, no power, duty or function conferred by or under that Act or any regulation made thereunder shall be exercised or performed that would permit the project to be carried out in whole or in part unless an environmental assessment of the project has been completed and a course of action has been taken in relation to the project in accordance with paragraph 37(1)(a).</p>	<p>SUSPENSION DES PRISES DE DÉCISION</p> <p>13. Dans le cas où un projet appartient à une catégorie visée dans la liste d'étude approfondie, ou si un examen par une commission ou un médiateur doit être effectué, malgré toute autre loi fédérale, l'exercice d'une attribution qui est prévu par cette loi ou ses règlements pour mettre en oeuvre le projet en tout ou en partie est subordonné à l'achèvement de l'évaluation environnementale de celui-ci et à la prise d'une décision à son égard aux termes de l'alinéa 37(1)a).</p>	Suspension de la prise de décision
	<p>ENVIRONMENTAL ASSESSMENT PROCESS</p> <p>GENERAL</p> <p>14. The environmental assessment process includes, where applicable,</p> <p>(a) a screening or comprehensive study and the preparation of a screening report or a comprehensive study report;</p>	<p>PROCESSUS D'ÉVALUATION ENVIRONNEMENTALE</p> <p>DISPOSITIONS GÉNÉRALES</p> <p>14. Le processus d'évaluation environnementale d'un projet comporte, selon le cas :</p> <p>a) un examen préalable ou une étude approfondie et l'établissement d'un rapport d'examen préalable ou d'un rapport d'étude approfondie;</p>	
Environmental assessment process			Processus d'évaluation environnementale

	<p>(b) a mediation or assessment by a review panel as provided in section 29 and the preparation of a report; and</p> <p>(c) the design and implementation of a follow-up program.</p>	<p>b) une médiation ou un examen par une commission prévu à l'article 29 et l'établissement d'un rapport;</p> <p>c) l'élaboration et l'application d'un programme de suivi.</p>	
Scope of project	<p>15. (1) The scope of the project in relation to which an environmental assessment is to be conducted shall be determined by</p> <p>(a) the responsible authority; or</p> <p>(b) where the project is referred to a mediator or a review panel, the Minister, after consulting with the responsible authority.</p>	<p>15. (1) L'autorité responsable ou, dans le cas où le projet est renvoyé à la médiation ou à l'examen par une commission, le ministre, après consultation de l'autorité responsable, détermine la portée du projet à l'égard duquel l'évaluation environnementale doit être effectuée.</p>	Détermination de la portée du projet
Same assessment for related projects	<p>(2) For the purposes of conducting an environmental assessment in respect of two or more projects,</p> <p>(a) the responsible authority, or</p> <p>(b) where at least one of the projects is referred to a mediator or a review panel, the Minister, after consulting with the responsible authority,</p> <p>may determine that the projects are so closely related that they can be considered to form a single project.</p>	<p>(2) Dans le cadre d'une évaluation environnementale de deux ou plusieurs projets, l'autorité responsable ou, si au moins un des projets est renvoyé à la médiation ou à l'examen par une commission, le ministre, après consultation de l'autorité responsable, peut décider que deux projets sont liés assez étroitement pour être considérés comme un seul projet.</p>	Pluralité de projets
All proposed undertakings to be considered	<p>(3) Where a project is in relation to a physical work, an environmental assessment shall be conducted in respect of every construction, operation, modification, decommissioning, abandonment or other undertaking in relation to that physical work that is proposed by the proponent or that is, in the opinion of</p> <p>(a) the responsible authority, or</p> <p>(b) where the project is referred to a mediator or a review panel, the Minister, after consulting with the responsible authority,</p> <p>likely to be carried out in relation to that physical work.</p> <p>1992, c. 37, s. 15; 1993, c. 34, s. 21(F).</p>	<p>(3) Est effectuée, dans l'un ou l'autre des cas suivants, l'évaluation environnementale de toute opération — construction, exploitation, modification, désaffectation, fermeture ou autre — constituant un projet lié à un ouvrage :</p> <p>a) l'opération est proposée par le promoteur;</p> <p>b) l'autorité responsable ou, dans le cadre d'une médiation ou de l'examen par une commission et après consultation de cette autorité, le ministre estime l'opération susceptible d'être réalisée en liaison avec l'ouvrage.</p> <p>1992, ch. 37, art. 15; 1993, ch. 34, art. 21(F).</p>	Projet lié à un ouvrage
Factors to be considered	<p>16. (1) Every screening or comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of the following factors:</p> <p>(a) the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other</p>	<p>16. (1) L'examen préalable, l'étude approfondie, la médiation ou l'examen par une commission d'un projet portent notamment sur les éléments suivants :</p> <p>a) les effets environnementaux du projet, y compris ceux causés par les accidents ou défaillances pouvant en résulter, et les effets cumulatifs que sa réalisation, combinée à l'existence d'autres ouvrages ou à la réalisa-</p>	Éléments à examiner

projects or activities that have been or will be carried out;

(b) the significance of the effects referred to in paragraph (a);

(c) comments from the public that are received in accordance with this Act and the regulations;

(d) measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project; and

(e) any other matter relevant to the screening, comprehensive study, mediation or assessment by a review panel, such as the need for the project and alternatives to the project, that the responsible authority or, except in the case of a screening, the Minister after consulting with the responsible authority, may require to be considered.

Additional factors

(2) In addition to the factors set out in subsection (1), every comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of the following factors:

(a) the purpose of the project;

(b) alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;

(c) the need for, and the requirements of, any follow-up program in respect of the project; and

(d) the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future.

Determination of factors

(3) The scope of the factors to be taken into consideration pursuant to paragraphs (1)(a), (b) and (d) and (2)(b), (c) and (d) shall be determined

(a) by the responsible authority; or

(b) where a project is referred to a mediator or a review panel, by the Minister, after consulting the responsible authority, when fixing the terms of reference of the mediation or review panel.

tion d'autres projets ou activités, est susceptible de causer à l'environnement;

b) l'importance des effets visés à l'alinéa a);

c) les observations du public à cet égard, reçues conformément à la présente loi et aux règlements;

d) les mesures d'atténuation réalisables, sur les plans technique et économique, des effets environnementaux importants du projet;

e) tout autre élément utile à l'examen préalable, à l'étude approfondie, à la médiation ou à l'examen par une commission, notamment la nécessité du projet et ses solutions de rechange, — dont l'autorité responsable ou, sauf dans le cas d'un examen préalable, le ministre, après consultation de celle-ci, peut exiger la prise en compte.

Éléments supplémentaires

(2) L'étude approfondie d'un projet et l'évaluation environnementale qui fait l'objet d'une médiation ou d'un examen par une commission portent également sur les éléments suivants :

a) les raisons d'être du projet;

b) les solutions de rechange réalisables sur les plans technique et économique, et leurs effets environnementaux;

c) la nécessité d'un programme de suivi du projet, ainsi que ses modalités;

d) la capacité des ressources renouvelables, risquant d'être touchées de façon importante par le projet, de répondre aux besoins du présent et à ceux des générations futures.

Obligations

(3) L'évaluation de la portée des éléments visés aux alinéas (1)a), b) et d) et (2)b), c) et d) incombe :

a) à l'autorité responsable;

b) au ministre, après consultation de l'autorité responsable, lors de la détermination du mandat du médiateur ou de la commission d'examen.

Factors not included	<p>(4) An environmental assessment of a project is not required to include a consideration of the environmental effects that could result from carrying out the project in response to a national emergency for which special temporary measures are taken under the <i>Emergencies Act</i>.</p> <p>1992, c. 37, s. 16; 1993, c. 34, s. 22(F).</p>	<p>(4) L'évaluation environnementale d'un projet n'a pas à porter sur les effets environnementaux que sa réalisation peut entraîner en réaction à des situations de crise nationale pour lesquelles des mesures d'intervention sont prises aux termes de la <i>Loi sur les mesures d'urgence</i>.</p> <p>1992, ch. 37, art. 16; 1993, ch. 34, art. 22(F).</p>	Situations de crise nationale
Community knowledge and aboriginal traditional knowledge	<p>16.1 Community knowledge and aboriginal traditional knowledge may be considered in conducting an environmental assessment.</p> <p>2003, c. 9, s. 8.</p>	<p>16.1 Les connaissances des collectivités et les connaissances traditionnelles autochtones peuvent être prises en compte pour l'évaluation environnementale d'un projet.</p> <p>2003, ch. 9, art. 8.</p>	Connaissances des collectivités et connaissances traditionnelles autochtones
Regional studies	<p>16.2 The results of a study of the environmental effects of possible future projects in a region, in which a federal authority participates, outside the scope of this Act, with other jurisdictions referred to in paragraph 12(5)(a), (c) or (d), may be taken into account in conducting an environmental assessment of a project in the region, particularly in considering any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out.</p> <p>2003, c. 9, s. 8.</p>	<p>16.2 Les résultats d'une étude des effets environnementaux de projets éventuels dans une région, faite hors du champ d'application de la présente loi et à laquelle une autorité fédérale a collaboré avec des instances, au sens des alinéas 12(5)a), c) ou d), peuvent être pris en compte dans l'évaluation environnementale d'un projet à réaliser dans cette région, notamment dans l'évaluation des effets cumulatifs que la réalisation du projet, combinée à celle d'autres projets ou activités déjà complétés ou à venir, est susceptible de produire sur l'environnement.</p> <p>2003, ch. 9, art. 8.</p>	Études régionales
Publication of determinations	<p>16.3 The responsible authority shall document and make available to the public, pursuant to subsection 55(1), its determinations pursuant to section 20.</p> <p>2003, c. 9, s. 8.</p>	<p>16.3 L'autorité responsable consigne et rend accessibles au public, conformément au paragraphe 55(1), les décisions qu'elle prend aux termes de l'article 20.</p> <p>2003, ch. 9, art. 8.</p>	Publication des décisions
Delegation	<p>17. (1) A responsible authority may delegate to any person, body or jurisdiction within the meaning of subsection 12(5) any part of the screening or comprehensive study of a project or the preparation of the screening report or comprehensive study report, and may delegate any part of the design and implementation of a follow-up program, but shall not delegate the duty to take a course of action pursuant to subsection 20(1) or 37(1).</p>	<p>17. (1) L'autorité responsable d'un projet peut déléguer à un organisme, une personne ou une instance, au sens du paragraphe 12(5), l'exécution de l'examen préalable ou de l'étude approfondie, ainsi que les rapports correspondants, et la conception et la mise en oeuvre d'un programme de suivi, à l'exclusion de toute prise de décision aux termes du paragraphe 20(1) ou 37(1).</p>	Délégation
Idem	<p>(2) For greater certainty, a responsible authority shall not take a course of action pursuant to subsection 20(1) or 37(1) unless it is satisfied that any duty or function delegated pursuant to subsection (1) has been carried out in accordance with this Act and the regulations.</p>	<p>(2) Il est entendu que l'autorité responsable qui a délégué l'exécution de l'examen ou de l'étude ainsi que l'établissement des rapports en vertu du paragraphe (1) ne peut prendre une décision aux termes du paragraphe 20(1) ou 37(1) que si elle est convaincue que les attributions déléguées ont été exercées conformément à la présente loi et à ses règlements.</p>	Précision

	SCREENING	EXAMEN PRÉALABLE	
Screening	<p>18. (1) Where a project is not described in the comprehensive study list or the exclusion list made under paragraph 59(c), the responsible authority shall ensure that</p> <p>(a) a screening of the project is conducted; and</p> <p>(b) a screening report is prepared.</p>	<p>18. (1) Dans le cas où le projet n'est pas visé dans la liste d'étude approfondie ou dans la liste d'exclusion établie par règlement pris en vertu de l'alinéa 59c), l'autorité responsable veille :</p> <p>a) à ce qu'en soit effectué l'examen préalable;</p> <p>b) à ce que soit établi un rapport d'examen préalable.</p>	Examen préalable
Source of information	<p>(2) Any available information may be used in conducting the screening of a project, but where a responsible authority is of the opinion that the information available is not adequate to enable it to take a course of action pursuant to subsection 20(1), it shall ensure that any studies and information that it considers necessary for that purpose are undertaken or collected.</p>	<p>(2) Dans le cadre de l'examen préalable qu'elle effectue, l'autorité responsable peut utiliser tous les renseignements disponibles; toutefois, si elle est d'avis qu'il n'existe pas suffisamment de renseignements pour lui permettre de prendre une décision en vertu du paragraphe 20(1), elle fait procéder aux études et à la collecte de renseignements nécessaires à cette fin.</p>	Information
Public participation	<p>(3) Where the responsible authority is of the opinion that public participation in the screening of a project is appropriate in the circumstances — or where required by regulation — the responsible authority</p> <p>(a) shall, before providing the public with an opportunity to examine and comment on the screening report, include in the Internet site a description of the scope of the project, the factors to be taken into consideration in the screening and the scope of those factors or an indication of how such a description may be obtained;</p> <p>(b) shall give the public an opportunity to examine and comment on the screening report and on any record relating to the project that has been included in the Registry before taking a course of action under section 20 and shall give adequate notice of that opportunity; and</p> <p>(c) may, at any stage of the screening that it determines, give the public any other opportunity to participate.</p>	<p>(3) Dans les cas où elle estime que la participation du public à l'examen préalable est indiquée ou dans les cas prévus par règlement, l'autorité responsable :</p> <p>a) verse au site Internet, avant de donner au public la possibilité d'examiner le rapport d'examen préalable et de faire des observations à son égard, une description de la portée du projet, des éléments à prendre en compte dans le cadre de l'examen préalable et de la portée de ceux-ci ou une indication de la façon d'obtenir copie de cette description;</p> <p>b) avant de prendre sa décision aux termes de l'article 20, donne au public la possibilité d'examiner le rapport d'examen préalable et tout document relatif au projet et de faire ses observations à leur égard et un avis suffisant de cette possibilité;</p> <p>c) peut donner au public la possibilité de prendre part à toute étape de l'examen préalable qu'elle choisit.</p>	Participation du public
Timing of public participation	<p>(4) The responsible authority's discretion under subsection (3) with respect to the timing of public participation is subject to a decision made by the federal environmental assessment coordinator under paragraph 12.3(c).</p> <p>1992, c. 37, s. 18; 1993, c. 34, s. 23(F); 2003, c. 9, s. 9.</p>	<p>(4) L'exercice du pouvoir discrétionnaire dont dispose l'autorité responsable, dans le cadre du paragraphe (3), de déterminer à quel moment peut se faire la participation du public est assujetti à toute décision pouvant être prise par</p>	Moment de la participation

		le coordonnateur fédéral de l'évaluation environnementale en vertu de l'alinéa 12.3c).	
		1992, ch. 37, art. 18; 1993, ch. 34, art. 23(F); 2003, ch. 9, art. 9.	
Class screening reports	19. (1) Subject to subsection (3), the Agency may declare a report to be a class screening report if projects of the class described in the report are not likely, in the opinion of the Agency, to cause significant adverse environmental effects when the design standards and mitigation measures described in the class screening report are applied.	19. (1) Sous réserve du paragraphe (3), l'Agence peut désigner tout rapport comme rapport d'examen préalable type applicable à une catégorie de projets, à la condition que les projets appartenant à la catégorie ne soient pas susceptibles, selon elle, de causer des effets environnementaux négatifs importants si les normes de conception et les mesures d'atténuation prévues par le rapport sont appliquées.	Rapport type
Use of class screening report	(2) The declaration shall include a statement that the class screening report may be used as (a) a replacement for the screening required by section 18, and the decision required by section 20, for projects of the class; or (b) a model for streamlining the screening required by section 18 for projects of the class.	(2) La désignation doit indiquer que le rapport d'examen préalable type peut servir : a) soit de substitut à l'examen préalable exigé par l'article 18 et à la décision visée par l'article 20 à l'égard de projets appartenant à la catégorie; b) soit de modèle pour simplifier l'examen préalable exigé par l'article 18 pour des projets appartenant à la catégorie.	Utilisation du rapport
Public notice and consideration of public comments	(3) The Agency shall, before making a declaration pursuant to subsection (1), (a) publish, in any manner it considers appropriate, a notice setting out the following information, namely, (i) the date on which the draft report will be available to the public, (ii) the place at which copies of it may be obtained, and (iii) the deadline and address for filing comments on the appropriateness of its use as a replacement or model for screenings for projects of that class; and (b) take into consideration any comments filed under subparagraph (a)(iii) and include in the Registry any comments filed by the public.	(3) Avant de faire une désignation, l'Agence : a) publie, selon les modalités qu'elle estime indiquées, un avis contenant les éléments suivants : (i) la date à laquelle l'ébauche du rapport sera accessible au public, (ii) le lieu où des exemplaires de celle-ci peuvent être obtenus, (iii) l'adresse et la date limite pour la réception par elle d'observations sur l'applicabilité du rapport comme modèle ou substitut de l'examen préalable pour les projets appartenant à la catégorie; b) prend en compte les observations reçues et conserve au registre les commentaires formulés par le public.	Avis public
Publication of declaration	(4) Any declaration made pursuant to subsection (1) shall be published in the <i>Canada Gazette</i> and, together with the report to which it relates or a description of how a copy of the report may be obtained, shall be included in the Internet site.	(4) La désignation est publiée dans la <i>Gazette du Canada</i> et versée, avec le rapport — ou une indication de la façon d'en obtenir copie —, au site Internet.	Publication
Use of a class screening report as a replacement	(5) Where a responsible authority is satisfied that a project falls within a class in respect of which a class screening report has been made	(5) Si l'autorité responsable estime que le projet appartient à une catégorie faisant l'objet d'un rapport d'examen préalable type visé à	Emploi d'un substitut

to which paragraph (2)(a) applies, no further action is required under section 18 or 20 with respect to the project, as long as the responsible authority ensures that the design standards and mitigation measures described in the report are implemented.

(6) Where a responsible authority is satisfied that a project or part of a project falls within a class in respect of which a class screening report has been made to which paragraph (2)(b) applies, the responsible authority may use or permit the use of that report and any screening on which it is based to whatever extent the responsible authority considers appropriate for the purpose of complying with section 18.

(7) Where a responsible authority uses or permits the use of a class screening report to which paragraph (2)(b) applies, it shall ensure that any adjustments are made to the report that are necessary to take into account local circumstances and any cumulative environmental effects that may result from the project in combination with other projects or activities that have been or will be carried out.

(8) Where the Agency determines that a class screening report is no longer appropriate to be used as a replacement or model in conducting screenings of other projects within the same class, the Agency may declare the report not to be a class screening report.

(9) Any declaration made pursuant to subsection (8) shall be published in the *Canada Gazette* and included in the Internet site.
1992, c. 37, s. 19; 1993, c. 34, s. 24(F); 2003, c. 9, s. 10.

20. (1) The responsible authority shall take one of the following courses of action in respect of a project after taking into consideration the screening report and any comments filed pursuant to subsection 18(3):

(a) subject to subparagraph (c)(iii), where, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate, the project is not likely to cause significant adverse environmental effects, the responsible authority may exercise any power or perform any duty or function that would permit the project to be carried out in whole or in part;

(b) where, taking into account the implementation of any mitigation measures that

l'alinéa (2)a), les mesures visées par les articles 18 et 20 ne sont plus applicables; l'autorité responsable doit toutefois veiller à ce que soient mises en œuvre les normes de conception et les mesures d'atténuation qui sont prévues au rapport visé par la désignation.

(6) Si l'autorité responsable estime que tout ou partie du projet appartient à une catégorie faisant l'objet d'un rapport d'examen préalable type visé à l'alinéa (2)b), l'autorité responsable peut utiliser les résultats de l'examen préalable et le rapport, ou en permettre l'utilisation, dans la mesure qu'elle estime indiquée pour l'application de l'article 18.

(7) Dans les cas visés au paragraphe (6), l'autorité responsable veille à ce que soient apportées au rapport d'examen préalable type les adaptations nécessaires à la prise en compte des facteurs locaux et des effets environnementaux cumulatifs qui, selon elle, peuvent résulter de la réalisation du projet combinée à l'existence d'autres ouvrages ou à la réalisation d'autres projets ou activités.

(8) L'Agence, si elle décide qu'un rapport type ne peut plus servir de substitut ou de modèle pour des projets appartenant à la catégorie, peut faire une déclaration en ce sens.

(9) La déclaration est publiée dans la *Gazette du Canada* et versée au site Internet.
1992, ch. 37, art. 19; 1993, ch. 34, art. 24(F); 2003, ch. 9, art. 10.

20. (1) L'autorité responsable prend l'une des mesures suivantes, après avoir pris en compte le rapport d'examen préalable et les observations reçues aux termes du paragraphe 18(3) :

a) sous réserve du sous-alinéa c)(iii), si la réalisation du projet n'est pas susceptible, compte tenu de l'application des mesures d'atténuation qu'elle estime indiquées, d'entraîner des effets environnementaux négatifs importants, exercer ses attributions afin de permettre la mise en œuvre totale ou partielle du projet;

b) si, compte tenu de l'application des mesures d'atténuation qu'elle estime indiquées, la réalisation du projet est susceptible d'entraî-

Use of class screening report as a model

Necessary adjustments

Declaration to remove class screening report

Publication

Decision of responsible authority following a screening

Emploi d'un modèle

Adaptations

Déclaration

Publication

Décision de l'autorité responsable

the responsible authority considers appropriate, the project is likely to cause significant adverse environmental effects that cannot be justified in the circumstances, the responsible authority shall not exercise any power or perform any duty or function conferred on it by or under any Act of Parliament that would permit the project to be carried out in whole or in part; or

(c) where

(i) it is uncertain whether the project, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate, is likely to cause significant adverse environmental effects,

(ii) the project, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate, is likely to cause significant adverse environmental effects and paragraph (b) does not apply, or

(iii) public concerns warrant a reference to a mediator or a review panel,

the responsible authority shall refer the project to the Minister for a referral to a mediator or a review panel in accordance with section 29.

Mitigation
measures —
extent of
authority

(1.1) Mitigation measures that may be taken into account under subsection (1) by a responsible authority are not limited to measures within the legislative authority of Parliament and include

(a) any mitigation measures whose implementation the responsible authority can ensure; and

(b) any other mitigation measures that it is satisfied will be implemented by another person or body.

Responsible
authority to
ensure
implementation
of mitigation
measures

(2) When a responsible authority takes a course of action referred to in paragraph (1)(a), it shall, with respect to any mitigation measures it has taken into account and that are described in paragraph (1.1)(a), ensure their implementation in any manner that it considers necessary and, in doing so, it is not limited to its duties or powers under any other Act of Parliament.

ner des effets environnementaux négatifs importants qui ne peuvent être justifiés dans les circonstances, ne pas exercer les attributions qui lui sont conférées sous le régime d'une loi fédérale et qui pourraient lui permettre la mise en oeuvre du projet en tout ou en partie;

c) s'adresser au ministre pour une médiation ou un examen par une commission prévu à l'article 29 :

(i) s'il n'est pas clair, compte tenu de l'application des mesures d'atténuation qu'elle estime indiquées, que la réalisation du projet soit susceptible d'entraîner des effets environnementaux négatifs importants,

(ii) si la réalisation du projet, compte tenu de l'application de mesures d'atténuation qu'elle estime indiquées, est susceptible d'entraîner des effets environnementaux négatifs importants et si l'alinéa b) ne s'applique pas,

(iii) si les préoccupations du public le justifient.

(1.1) Les mesures d'atténuation que l'autorité responsable peut prendre en compte dans le cadre du paragraphe (1) ne se limitent pas à celles qui relèvent de la compétence législative du Parlement; elles comprennent :

a) les mesures d'atténuation dont elle peut assurer l'application;

b) toute autre mesure d'atténuation dont elle est convaincue qu'elle sera appliquée par une autre personne ou un autre organisme.

Mesures
d'atténuation —
étendue des
pouvoirs

(2) Si elle prend une décision dans le cadre de l'alinéa (1)a), l'autorité responsable veille à l'application des mesures d'atténuation qu'elle a prises en compte et qui sont visées à l'alinéa (1.1)a) de la façon qu'elle estime nécessaire, même si aucune autre loi fédérale ne lui confère de tels pouvoirs d'application.

Application des
mesures
d'atténuation

Assistance of other federal authority	(2.1) A federal authority shall provide any assistance requested by a responsible authority in ensuring the implementation of a mitigation measure on which the federal authority and the responsible authority have agreed.	(2.1) Il incombe à l'autorité fédérale qui convient avec l'autorité responsable de mesures d'atténuation d'appuyer celle-ci, sur demande, dans l'application de ces mesures.	Appui à l'autorité responsable
Prohibition of actions in furtherance of project	(3) Where the responsible authority takes a course of action pursuant to paragraph (1)(b) in relation to a project, the responsible authority shall publish a notice of that course of action in the Registry and, notwithstanding any other Act of Parliament, no power, duty or function conferred by or under that Act or any regulation made under it shall be exercised or performed that would permit that project to be carried out in whole or in part.	(3) L'autorité responsable qui prend la décision visée à l'alinéa (1)b) à l'égard d'un projet est tenue de publier un avis de cette décision dans le registre, et aucune attribution conférée sous le régime de toute autre loi fédérale ou de ses règlements ne peut être exercée de façon à permettre la mise en œuvre, en tout ou en partie, du projet.	Interdiction de mise en œuvre
Time for decision	(4) A responsible authority shall not take any course of action under subsection (1) before the 15th day after the inclusion on the Internet site of (a) notice of the commencement of the environmental assessment; (b) a description of the scope of the project; and (c) where the responsible authority, in accordance with subsection 18(3), gives the public an opportunity to participate in the screening of a project, a description of the factors to be taken into consideration in the environmental assessment and of the scope of those factors or an indication of how such a description may be obtained. 1992, c. 37, s. 20; 1993, c. 34, s. 25(F); 2003, c. 9, s. 11.	(4) L'autorité responsable ne peut prendre une décision dans le cadre du paragraphe (1) avant le quinzième jour suivant le versement au site Internet des documents suivants : a) l'avis du début de l'évaluation environnementale; b) la description de la portée du projet; c) dans le cas où l'autorité responsable donne, au titre du paragraphe 18(3), la possibilité au public de participer à l'examen préalable, la description des éléments à prendre en compte dans le cadre de l'évaluation environnementale et de la portée de ceux-ci ou une indication de la façon d'obtenir copie de cette description. 1992, ch. 37, art. 20; 1993, ch. 34, art. 25(F); 2003, ch. 9, art. 11.	Versement préalable de documents
COMPREHENSIVE STUDY			
Public consultation	21. (1) Where a project is described in the comprehensive study list, the responsible authority shall ensure public consultation with respect to the proposed scope of the project for the purposes of the environmental assessment, the factors proposed to be considered in its assessment, the proposed scope of those factors and the ability of the comprehensive study to address issues relating to the project.	21. (1) Dans le cas où le projet est visé dans la liste d'étude approfondie, l'autorité responsable veille à la tenue d'une consultation publique sur les propositions relatives à la portée du projet en matière d'évaluation environnementale, aux éléments à prendre en compte dans le cadre de l'évaluation et à la portée de ces éléments ainsi que sur la question de savoir si l'étude approfondie permet l'examen des questions soulevées par le projet.	Consultation
Report and recommendation	(2) After the public consultation, as soon as it is of the opinion that it has sufficient information to do so, the responsible authority shall (a) report to the Minister regarding	(2) L'autorité responsable, dès qu'elle estime disposer de suffisamment de renseignements et après avoir tenu la consultation publique :	Rapport et recommandation

- (i) the scope of the project, the factors to be considered in its assessment and the scope of those factors,
- (ii) public concerns in relation to the project,
- (iii) the potential of the project to cause adverse environmental effects, and
- (iv) the ability of the comprehensive study to address issues relating to the project; and

(b) recommend to the Minister to continue with the environmental assessment by means of a comprehensive study, or to refer the project to a mediator or review panel in accordance with section 29.

1992, c. 37, s. 21; 1993, c. 34, s. 26(F); 2003, c. 9, s. 12.

Minister's decision

21.1 (1) The Minister, taking into account the things with regard to which the responsible authority must report under paragraph 21(2)(a) and the recommendation of the responsible authority under paragraph 21(2)(b), shall, as the Minister considers appropriate,

(a) refer the project to the responsible authority so that it may continue the comprehensive study and ensure that a comprehensive study report is prepared and provided to the Minister and to the Agency; or

(b) refer the project to a mediator or review panel in accordance with section 29.

Decision final

(2) Despite any other provision of this Act, if the Minister refers the project to a responsible authority under paragraph (1)(a), it may not be referred to a mediator or review panel in accordance with section 29.

2003, c. 9, s. 12.

Public participation

21.2 Where a project has been referred to a responsible authority under paragraph 21.1(1)(a), the responsible authority shall ensure that the public is provided with an opportunity, in addition to those provided under subsection 21(1) and section 22, to participate in the comprehensive study, subject to a decision with respect to the timing of the participation made by the federal environmental assessment coordinator under paragraph 12.3(c).

2003, c. 9, s. 12.

a) fait rapport au ministre de la portée du projet, des éléments à prendre en compte dans le cadre de l'évaluation, de la portée de ceux-ci, des préoccupations du public, de la possibilité d'effets environnementaux négatifs et de la question de savoir si l'étude approfondie permet l'examen des questions soulevées par le projet;

b) lui recommande de poursuivre l'évaluation environnementale par étude approfondie ou de la renvoyer à un médiateur ou à une commission conformément à l'article 29.

1992, ch. 37, art. 21; 1993, ch. 34, art. 26(F); 2003, ch. 9, art. 12.

Décision du ministre

21.1 (1) Le ministre, prenant en compte tous les éléments qui doivent lui être signalés dans le cadre de l'alinéa 21(2)a) et les recommandations de l'autorité responsable et selon ce qu'il estime indiqué dans les circonstances :

a) renvoie le projet à l'autorité responsable pour qu'elle poursuive l'étude approfondie et qu'elle veille à ce qu'un rapport de cette étude lui soit présenté, de même qu'à l'Agence;

b) renvoie le projet à la médiation ou à l'examen par une commission conformément à l'article 29.

(2) Malgré toute autre disposition de la présente loi, le projet que le ministre renvoie à l'autorité responsable au titre de l'alinéa (1)a) ne peut faire l'objet d'une médiation ou d'un examen par une commission conformément à l'article 29.

2003, ch. 9, art. 12.

Caractère définitif de la décision

21.2 En plus des consultations publiques prévues au paragraphe 21(1) et à l'article 22, l'autorité responsable à laquelle le projet est renvoyé en vertu de l'alinéa 21.1(1)a) est tenue de veiller à ce que le public ait la possibilité de prendre part à l'étude approfondie. Elle est toutefois assujettie à toute décision éventuellement prise par le coordonnateur fédéral de l'évaluation environnementale en vertu de l'alinéa 12.3c) quant au moment de la participation.

2003, ch. 9, art. 12.

Participation du public à l'étude approfondie

Public notice	<p>22. (1) After receiving a comprehensive study report in respect of a project, the Agency shall, in any manner it considers appropriate to facilitate public access to the report, publish a notice setting out the following information:</p> <ul style="list-style-type: none"> (a) the date on which the comprehensive study report will be available to the public; (b) the place at which copies of the report may be obtained; and (c) the deadline and address for filing comments on the conclusions and recommendations of the report. 	<p>22. (1) Quand elle reçoit un rapport d'étude approfondie, l'Agence donne avis, de la façon qu'elle estime indiquée pour favoriser l'accès du public au rapport, des éléments suivants :</p> <ul style="list-style-type: none"> a) la date à laquelle le rapport d'étude approfondie sera accessible au public; b) le lieu d'obtention d'exemplaires du rapport; c) l'adresse et la date limite pour la réception par celle-ci d'observations sur les conclusions et recommandations du rapport. 	Avis public
Public concerns	<p>(2) Prior to the deadline set out in the notice published by the Agency, any person may file comments with the Agency relating to the conclusions and recommendations and any other aspect of the comprehensive study report.</p>	<p>(2) Toute personne peut, dans le délai indiqué dans l'avis publié par l'Agence, lui présenter ses observations relativement aux conclusions ou recommandations issues de l'étude approfondie ou à tout autre aspect du rapport qui y fait suite.</p>	Observations du public
Decision of Minister	<p>23. (1) The Minister shall, after taking into consideration the comprehensive study report and any comments filed pursuant to subsection 22(2), refer the project back to the responsible authority for action under section 37 and issue an environmental assessment decision statement that</p> <ul style="list-style-type: none"> (a) sets out the Minister's opinion as to whether, taking into account the implementation of any mitigation measures that the Minister considers appropriate, the project is or is not likely to cause significant adverse environmental effects; and (b) sets out any mitigation measures or follow-up program that the Minister considers appropriate, after having taken into account the views of the responsible authorities and other federal authorities concerning the measures and program. 	<p>23. (1) Le ministre, après avoir pris en compte le rapport d'étude approfondie et les observations qui ont été présentées en vertu du paragraphe 22(2), renvoie le projet à l'autorité responsable pour qu'elle prenne une décision en application de l'article 37 et fait une déclaration dans laquelle :</p> <ul style="list-style-type: none"> a) il indique si, selon lui, le projet est susceptible ou non, compte tenu de la mise en œuvre des mesures d'atténuation qu'il estime appropriées, d'entraîner des effets environnementaux négatifs importants; b) il indique, s'il y a lieu, les mesures d'atténuation et tout programme de suivi qu'il estime appropriés, compte tenu des observations des autorités responsables et des autorités fédérales concernant ces mesures ou programmes. 	Avis du ministre
More information required	<p>(2) Before issuing the environmental assessment decision statement, the Minister shall, if the Minister is of the opinion that additional information is necessary or that there are public concerns that need to be further addressed, request that the federal authorities referred to in paragraph 12.3(a) or the proponent ensure that the necessary information is provided or actions are taken to address those public concerns.</p>	<p>(2) Avant de faire la déclaration, le ministre, s'il estime qu'il lui faut des renseignements supplémentaires ou qu'il convient de mieux répondre aux préoccupations du public, demande aux autorités fédérales visées à l'alinéa 12.3a) ou au promoteur de veiller à ce que les renseignements nécessaires soient fournis ou à ce que les mesures nécessaires pour répondre aux préoccupations du public soient prises.</p>	Renseignements supplémentaires
Time for statement	<p>(3) The Minister shall not issue the environmental assessment decision statement before</p>	<p>(3) Le ministre ne peut faire la déclaration avant le trentième jour suivant la date à laquelle</p>	Versement préalable de documents

the 30th day after the inclusion on the Internet site of

- (a) notice of the commencement of the environmental assessment;
- (b) a description of the scope of the project;
- (c) where the Minister, under paragraph 21.1(1)(a), refers a project to the responsible authority to continue a comprehensive study,
 - (i) notice of the Minister's decision to so refer the project, and
 - (ii) a description of the factors to be taken into consideration in the environmental assessment and of the scope of those factors or an indication of how such a description may be obtained; and
- (d) the comprehensive study report that is to be taken into consideration by a responsible authority in making its decision under subsection 37(1) or a description of how a copy of the report may be obtained.

1992, c. 37, s. 23; 2003, c. 9, s. 13.

Use of
previously
conducted
environmental
assessment

24. (1) Where a proponent proposes to carry out, in whole or in part, a project for which an environmental assessment was previously conducted and

- (a) the project did not proceed after the assessment was completed,
- (b) in the case of a project that is in relation to a physical work, the proponent proposes an undertaking in relation to that work different from that proposed when the assessment was conducted,
- (c) the manner in which the project is to be carried out has subsequently changed, or
- (d) the renewal of a licence, permit, approval or other action under a prescribed provision is sought,

the responsible authority shall use that assessment and the report thereon to whatever extent is appropriate for the purpose of complying with section 18 or 21.

Necessary
adjustments

(2) Where a responsible authority uses an environmental assessment and the report thereon pursuant to subsection (1), the responsible authority shall ensure that any adjustments are made to the report that are necessary to take into account any significant changes in the envi-

les documents suivants sont versés au site Internet :

- a) l'avis du début de l'évaluation environnementale;
- b) la description de la portée du projet;
- c) dans le cas où il renvoie, au titre de l'alinéa 21.1(1)a), le projet à l'autorité responsable pour qu'elle poursuive l'étude approfondie :
 - (i) l'avis de sa décision de renvoyer le projet,
 - (ii) la description des éléments à prendre en compte dans le cadre de l'évaluation environnementale et de la portée de ceux-ci ou une indication de la façon d'obtenir copie de cette description;
- d) le rapport de l'étude approfondie sur lequel se fonde la décision de l'autorité responsable au titre du paragraphe 37(1), ou une indication de la façon d'en obtenir copie.

1992, ch. 37, art. 23; 2003, ch. 9, art. 13.

Utilisation d'une
évaluation
antérieure

24. (1) Si un promoteur se propose de mettre en oeuvre, en tout ou en partie, un projet ayant déjà fait l'objet d'une évaluation environnementale, l'autorité responsable doit utiliser l'évaluation et le rapport correspondant dans la mesure appropriée pour l'application des articles 18 ou 21 dans chacun des cas suivants :

- a) le projet n'a pas été mis en oeuvre après l'achèvement de l'évaluation;
- b) le projet est lié à un ouvrage à l'égard duquel le promoteur propose une réalisation différente de celle qui était proposée au moment de l'évaluation;
- c) les modalités de mise en oeuvre du projet ont par la suite été modifiées;
- d) il est demandé qu'un permis, une licence ou une autorisation soit renouvelé, ou qu'une autre mesure prévue par disposition réglementaire soit prise.

Adaptations
nécessaires

(2) Dans les cas visés au paragraphe (1), l'autorité responsable veille à ce que soient apportées au rapport les adaptations nécessaires à la prise en compte des changements importants de circonstances survenus depuis l'évaluation

ronment and in the circumstances of the project and any significant new information relating to the environmental effects of the project.

1992, c. 37, s. 24; 1993, c. 34, s. 27(F); 1994, c. 46, s. 2.

DISCRETIONARY POWERS

Referral to
Minister

25. Subject to paragraphs 20(1)(b) and (c), where at any time a responsible authority is of the opinion that

(a) a project, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate, may cause significant adverse environmental effects, or

(b) public concerns warrant a reference to a mediator or a review panel,

the responsible authority may request the Minister to refer the project to a mediator or a review panel in accordance with section 29.

Termination by
responsible
authority

26. Where at any time a responsible authority decides not to exercise any power or perform any duty or function referred to in section 5 in relation to a project that has not been referred to a mediator or a review panel, it may terminate the environmental assessment of the project.

Termination by
Minister

27. Where at any time a responsible authority decides not to exercise any power or perform any duty or function referred to in section 5 in relation to a project that has been referred to a mediator or a review panel, the Minister may terminate the environmental assessment of the project.

Referral by
Minister

28. (1) Where at any time the Minister is of the opinion that

(a) a project for which an environmental assessment may be required under section 5, taking into account the implementation of any appropriate mitigation measures, may cause significant adverse environmental effects, or

(b) public concerns warrant a reference to a mediator or a review panel,

the Minister may, after offering to consult with the jurisdiction, within the meaning of subsection 12(5), where the project is to be carried out and after consulting with the responsible authority or, where there is no responsible author-

et de tous renseignements importants relatifs aux effets environnementaux du projet.

1992, ch. 37, art. 24; 1993, ch. 34, art. 27(F); 1994, ch. 46, art. 2.

POUVOIRS D'APPRÉCIATION

Examen par une
commission

25. Sous réserve des alinéas 20(1)b) et c), à tout moment, si elle estime soit que le projet, compte tenu de l'application des mesures d'atténuation qu'elle estime indiquées, peut entraîner des effets environnementaux négatifs importants, soit que les préoccupations du public justifient une médiation ou un examen par une commission, l'autorité responsable peut demander au ministre d'y faire procéder conformément à l'article 29.

Arrêt d'une
évaluation
environnementale

26. L'autorité responsable peut, à tout moment au cours d'une évaluation environnementale qui n'a pas fait l'objet d'une médiation ou d'un examen par une commission, mettre fin à l'évaluation si elle décide de ne pas exercer les attributions visées à l'article 5 qu'elle possède à l'égard du projet.

Pouvoir du
ministre

27. Le ministre peut, à tout moment au cours d'une évaluation environnementale qui fait l'objet d'une médiation ou d'un examen par une commission, mettre fin à l'évaluation si l'autorité responsable décide de ne pas exercer les attributions visées à l'article 5 qu'elle possède à l'égard du projet.

Idem

28. (1) À tout moment, le ministre, après avoir offert de consulter l'instance, au sens du paragraphe 12(5), responsable du lieu où le projet doit être réalisé et après consultation de l'autorité responsable, ou, à défaut, de toute autorité fédérale compétente, s'il estime soit qu'un projet assujéti à l'évaluation environnementale aux termes de l'article 5 peut, compte tenu de l'application des mesures d'atténuation indiquées, entraîner des effets environnementaux négatifs importants, soit que les préoccupations du public le justifient, peut faire procéder à une médiation ou à un examen par une commission conformément à l'article 29.

ity in relation to the project, the appropriate federal authority, refer the project to a mediator or a review panel in accordance with section 29.

Mackenzie Valley Resource Management Act

(2) Where a proposal is referred pursuant to paragraph 130(1)(c) of the *Mackenzie Valley Resource Management Act*, the Minister shall refer the proposal to a review panel.

1992, c. 37, s. 28; 1998, c. 25, s. 162.

MEDIATION AND PANEL REVIEWS

Initial referral to mediator or review panel

29. (1) Subject to subsection (2), where a project is to be referred to a mediator or a review panel, the Minister shall

(a) refer the environmental assessment relating to the project to

(i) a mediator, or

(ii) a review panel; or

(b) refer part of the environmental assessment relating to the project to a mediator and part of that assessment to a review panel.

Condition on reference to mediator

(2) An environmental assessment or a part thereof shall not be referred to a mediator unless the interested parties have been identified and are willing to participate in the mediation.

Subsequent reference to a mediator

(3) The Minister may, at any time, refer any issue relating to an assessment by a review panel to a mediator where the Minister is of the opinion, after consulting with the review panel, that mediation is appropriate in respect of that issue.

When mediation fails

(4) Where, at any time after an environmental assessment or part of an environmental assessment of a project has been referred to a mediator, the Minister or the mediator determines that the mediation is not likely to produce a result that is satisfactory to all the participants, the Minister shall order the conclusion of the mediation.

1992, c. 37, s. 29; 2003, c. 9, s. 14.

Appointment of mediator

30. (1) Where a reference is made under subparagraph 29(1)(a)(i) in relation to a project, the Minister shall, after consulting with the responsible authority and all parties who are to participate in the mediation,

(2) Dans les cas où il en est saisi en vertu de l'alinéa 130(1)c) de la *Loi sur la gestion des ressources de la vallée du Mackenzie*, le ministre est tenu de soumettre l'affaire à un examen par une commission.

1992, ch. 37, art. 28; 1998, ch. 25, art. 162.

Loi sur la gestion des ressources de la vallée du Mackenzie

MÉDIATION OU EXAMEN PAR UNE COMMISSION

29. (1) Sous réserve du paragraphe (2), dans le cas où un projet doit faire l'objet d'une médiation ou d'un examen par une commission, le ministre :

a) soit renvoie l'évaluation environnementale du projet à un médiateur ou à une commission;

b) soit renvoie une partie de l'évaluation environnementale du projet à un médiateur et une partie de celle-ci à une commission.

Décision du ministre

(2) Le ministre ne renvoie la totalité d'une évaluation environnementale ou une partie de celle-ci à un médiateur que si les parties intéressées ont été identifiées et acceptent de participer à la médiation.

Conditions

(3) À tout moment le ministre peut renvoyer une question relative à une évaluation environnementale soumise à l'examen par une commission à un médiateur si, après avoir consulté la commission d'examen, il estime que la médiation est indiquée relativement à cette question.

Pouvoir du ministre

(4) Dans le cas où, à tout moment après le renvoi de l'évaluation environnementale d'un projet ou d'une partie de celle-ci à un médiateur, le ministre ou le médiateur estime que la médiation n'est pas susceptible de donner des résultats satisfaisants pour les parties, le ministre met fin à la médiation.

Pouvoirs du ministre

1992, ch. 37, art. 29; 2003, ch. 9, art. 14.

30. (1) S'il effectue le renvoi au médiateur visé à l'alinéa 29(1)a), le ministre, après consultation de l'autorité responsable et des parties qui doivent participer à la médiation :

Nomination du médiateur

a) nomme médiateur une personne :

	<p>(a) appoint as mediator any person who</p> <p>(i) is unbiased and free from any conflict of interest relative to the project and who has knowledge or experience in acting as a mediator, and</p> <p>(ii) may have been selected from a roster established pursuant to subsection (2); and</p> <p>(b) fix the terms of reference of the mediation.</p>	<p>(i) impartiale, non en conflit d'intérêts avec le projet et pourvue des connaissances ou de l'expérience voulues pour agir comme médiateur,</p> <p>(ii) qui peut avoir été choisie sur la liste établie en vertu du paragraphe (2);</p> <p>b) fixe son mandat.</p>	
Establishment of roster	<p>(2) The Minister may establish a roster of persons to act as mediators to be appointed pursuant to paragraph (1)(a).</p>	<p>(2) Le ministre peut établir une liste de personnes qui peuvent être nommées médiateurs aux termes de l'alinéa (1)a).</p>	Liste
Additional participants	<p>31. The mediator may, at any time, allow an additional interested party to participate in a mediation.</p>	<p>31. Le médiateur peut, à tout moment, permettre à une partie intéressée supplémentaire de participer à la médiation.</p>	Parties
Mediation report	<p>32. (1) A mediator shall, at the conclusion of the mediation, prepare and submit a report to the Minister and to the responsible authority.</p>	<p>32. (1) Dès la fin de la médiation, le médiateur présente un rapport au ministre et à l'autorité responsable.</p>	Rapport du médiateur
Privilege	<p>(2) No evidence of or relating to a statement made by a mediator or a participant to the mediation during the course of and for the purposes of the mediation is admissible without the consent of the mediator or participant, in any proceeding before a review panel, court, tribunal, body or person with jurisdiction to compel the production of evidence.</p> <p>1992, c. 37, s. 32; 2003, c. 9, s. 15(F).</p>	<p>(2) Sauf consentement du médiateur ou d'un participant à la médiation, les déclarations faites par l'un ou l'autre de ceux-ci dans le cadre de la médiation ne sont pas admissibles en preuve devant un organisme ou une personne habilités à contraindre des personnes à déposer en justice, notamment une commission ou un tribunal.</p> <p>1992, ch. 37, art. 32; 2003, ch. 9, art. 15(F).</p>	Inadmissibilité en preuve des déclarations
Appointment of review panel	<p>33. (1) Where a project is referred to a review panel, the Minister shall, in consultation with the responsible authority,</p> <p>(a) appoint as members of the panel, including the chairperson thereof, persons who</p> <p>(i) are unbiased and free from any conflict of interest relative to the project and who have knowledge or experience relevant to the anticipated environmental effects of the project, and</p> <p>(ii) may have been selected from a roster established pursuant to subsection (2); and</p> <p>(b) fix the terms of reference of the panel.</p>	<p>33. (1) Le ministre, en consultation avec l'autorité responsable, nomme les membres, y compris le président, de la commission d'évaluation environnementale et fixe le mandat de celle-ci. À cette fin, le ministre choisit des personnes :</p> <p>a) impartiales, non en conflit d'intérêts avec le projet et pourvues des connaissances ou de l'expérience voulues touchant les effets environnementaux prévisibles du projet;</p> <p>b) qui peuvent avoir été choisies sur la liste établie en vertu du paragraphe (2).</p>	Commission
Establishment of roster	<p>(2) The Minister may establish a roster of persons, to act as members of any review panel to be established pursuant to paragraph (1)(a).</p> <p>1992, c. 37, s. 33; 1993, c. 34, s. 28(F).</p>	<p>(2) Le ministre peut établir une liste de personnes qui peuvent être nommées membres d'une commission aux termes de l'alinéa (1)a).</p> <p>1992, ch. 37, art. 33; 1993, ch. 34, art. 28(F).</p>	Liste
Assessment by review panel	<p>34. A review panel shall, in accordance with any regulations made for that purpose and with its term of reference,</p>	<p>34. La commission, conformément à son mandat et aux règlements pris à cette fin :</p>	Commission d'évaluation environnementale

	<p>(a) ensure that the information required for an assessment by a review panel is obtained and made available to the public;</p> <p>(b) hold hearings in a manner that offers the public an opportunity to participate in the assessment;</p> <p>(c) prepare a report setting out</p> <ul style="list-style-type: none"> (i) the rationale, conclusions and recommendations of the panel relating to the environmental assessment of the project, including any mitigation measures and follow-up program, and (ii) a summary of any comments received from the public; and <p>(d) submit the report to the Minister and the responsible authority.</p>	<p>a) veille à l'obtention des renseignements nécessaires à l'évaluation environnementale d'un projet et veille à ce que le public y ait accès;</p> <p>b) tient des audiences de façon à donner au public la possibilité de participer à l'évaluation environnementale du projet;</p> <p>c) établit un rapport assorti de sa justification, de ses conclusions et recommandations relativement à l'évaluation environnementale du projet, notamment aux mesures d'atténuation et au programme de suivi, et énonçant, sous la forme d'un résumé, les observations reçues du public;</p> <p>d) présente son rapport au ministre et à l'autorité responsable.</p>	
Powers of review panel	<p>35. (1) A review panel has the power of summoning any person to appear as a witness before the panel and of ordering the witness to</p> <ul style="list-style-type: none"> (a) give evidence, orally or in writing; and (b) produce such documents and things as the panel considers necessary for conducting its assessment of the project. 	<p>35. (1) La commission a le pouvoir d'assigner devant elle des témoins et de leur ordonner de :</p> <ul style="list-style-type: none"> a) déposer oralement ou par écrit; b) produire les documents et autres pièces qu'elle juge nécessaires en vue de procéder à l'examen dont elle est chargée. 	Pouvoirs de la commission
Enforcement powers	<p>(2) A review panel has the same power to enforce the attendance of witnesses and to compel them to give evidence and produce documents and other things as is vested in a court of record.</p>	<p>(2) La commission a, pour contraindre les témoins à comparaître, à déposer et à produire des pièces, les pouvoirs d'une cour d'archives.</p>	Pouvoirs de contrainte
Hearings to be public	<p>(3) A hearing by a review panel shall be public unless the panel is satisfied after representations made by a witness that specific, direct and substantial harm would be caused to the witness or specific harm to the environment by the disclosure of the evidence, documents or other things that the witness is ordered to give or produce pursuant to subsection (1).</p>	<p>(3) Les audiences de la commission sont publiques sauf si elle décide, à la suite d'observations faites par le témoin, que la communication des éléments de preuve, documents ou objets qu'il est tenu de présenter au titre du paragraphe (1) lui causerait directement un préjudice réel et sérieux ou causerait un préjudice réel à l'environnement.</p>	Audiences publiques
Non-disclosure	<p>(4) Where a review panel is satisfied that the disclosure of evidence, documents or other things would cause specific, direct and substantial harm to a witness, the evidence, documents or things are privileged and shall not, without the authorization of the witness, knowingly be or be permitted to be communicated, disclosed or made available by any person who has obtained the evidence, documents or other things pursuant to this Act.</p>	<p>(4) Si la commission conclut que la communication d'éléments de preuve, de documents ou d'objets causerait directement un préjudice réel et sérieux au témoin, ces éléments de preuve, documents ou objets sont protégés; la personne qui les a obtenus en vertu de la présente loi ne peut sciemment les communiquer ou permettre qu'ils le soient sans l'autorisation du témoin.</p>	Non-communication
Non-disclosure	<p>(4.1) Where a review panel is satisfied that the disclosure of evidence, documents or other</p>	<p>(4.1) Si la commission conclut qu'un préjudice réel, pour l'environnement, résulterait de</p>	Non-communication

things would cause specific harm to the environment, the evidence, documents or things are privileged and shall not, without the authorization of the review panel, knowingly be or be permitted to be communicated, disclosed or made available by any person who has obtained the evidence, documents or other things pursuant to this Act.

la communication d'éléments de preuve, de documents ou d'objets, ces éléments de preuve, documents ou objets sont protégés; la personne qui les a obtenus en vertu de la présente loi ne peut sciemment les communiquer ou permettre qu'ils le soient sans l'autorisation de la commission.

Enforcement of summonses and orders

(5) Any summons issued or order made by a review panel pursuant to subsection (1) shall, for the purposes of enforcement, be made a summons or order of the Federal Court by following the usual practice and procedure.

(5) Aux fins de leur exécution, les assignations faites et ordonnances rendues aux termes du paragraphe (1) sont, selon la procédure habituelle, assimilées aux assignations ou ordonnances de la Cour fédérale.

Exécution des assignations et ordonnances

Immunity

(6) No action or other proceeding lies or shall be commenced against a member of a review panel for or in respect of anything done or omitted to be done, during the course of and for the purposes of the assessment by the review panel.

(6) Les membres d'une commission d'examen sont soustraits aux poursuites et autres procédures pour les faits — actes ou omissions — censés accomplis dans le cadre d'un examen par la commission.

Immunité

1992, c. 37, s. 35; 2003, c. 9, s. 16.

1992, ch. 37, art. 35; 2003, ch. 9, art. 16.

Public notice

36. On receiving a report submitted by a mediator or a review panel, the Minister shall make the report available to the public in any manner the Minister considers appropriate to facilitate public access to the report, and shall advise the public that the report is available.

36. Sur réception du rapport du médiateur ou de la commission d'évaluation environnementale, le ministre en donne avis public et en favorise l'accès par le public de la manière qu'il estime indiquée.

Publication

DECISION OF RESPONSIBLE AUTHORITY

DÉCISION DE L'AUTORITÉ RESPONSABLE

Decision of responsible authority

37. (1) Subject to subsections (1.1) to (1.3), the responsible authority shall take one of the following courses of action in respect of a project after taking into consideration the report submitted by a mediator or a review panel or, in the case of a project referred back to the responsible authority pursuant to subsection 23(1), the comprehensive study report:

37. (1) Sous réserve des paragraphes (1.1) à (1.3), l'autorité responsable, après avoir pris en compte le rapport du médiateur ou de la commission ou, si le projet lui est renvoyé aux termes du paragraphe 23(1), le rapport d'étude approfondie, prend l'une des décisions suivantes :

Autorité responsable

(a) where, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate,

a) si, compte tenu de l'application des mesures d'atténuation qu'elle estime indiquées, la réalisation du projet n'est pas susceptible d'entraîner des effets environnementaux négatifs importants ou est susceptible d'en entraîner qui sont justifiables dans les circonstances, exercer ses attributions afin de permettre la mise en œuvre totale ou partielle du projet;

(i) the project is not likely to cause significant adverse environmental effects, or

b) si, compte tenu de l'application des mesures d'atténuation qu'elle estime indiquées, la réalisation du projet est susceptible d'entraîner des effets environnementaux qui ne sont pas justifiables dans les circonstances, ne pas exercer les attributions qui lui sont conférées sous le régime d'une loi fédérale et

(ii) the project is likely to cause significant adverse environmental effects that can be justified in the circumstances,

the responsible authority may exercise any power or perform any duty or function that would permit the project to be carried out in whole or in part; or

(b) where, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate, the project is likely to cause significant adverse environmental effects that cannot be justified in the circumstances, the responsible authority shall not exercise any power or perform any duty or function conferred on it by or under any Act of Parliament that would permit the project to be carried out in whole or in part.

qui pourraient permettre la mise en oeuvre du projet en tout ou en partie.

Approval of
Governor in
Council

(1.1) Where a report is submitted by a mediator or review panel,

(a) the responsible authority shall take into consideration the report and, with the approval of the Governor in Council, respond to the report;

(b) the Governor in Council may, for the purpose of giving the approval referred to in paragraph (a), require the mediator or review panel to clarify any of the recommendations set out in the report; and

(c) the responsible authority shall take a course of action under subsection (1) that is in conformity with the approval of the Governor in Council referred to in paragraph (a).

(1.1) Une fois pris en compte le rapport du médiateur ou de la commission, l'autorité responsable est tenue d'y donner suite avec l'agrément du gouverneur en conseil, qui peut demander des précisions sur l'une ou l'autre de ses conclusions; l'autorité responsable prend alors la décision visée au titre du paragraphe (1) conformément à l'agrément.

Agrément du
gouverneur en
conseil

Federal
authority

(1.2) Where a response to a report is required under paragraph (1.1)(a) and there is, in addition to a responsible authority, a federal authority referred to in paragraph 5(2)(b) in relation to the project, that federal authority may act as a responsible authority for the purposes of that response. This subsection applies in the case of a federal authority within the meaning of paragraph (b) of the definition "federal authority" in subsection 2(1) if the Minister through whom the authority is accountable to Parliament agrees.

(1.2) Lorsqu'une autorité responsable a l'obligation, en vertu du paragraphe (1.1), de donner suite au rapport qui y est visé, toute autorité fédérale dont le rôle à l'égard du projet est prévu à l'alinéa 5(2)b) peut prendre part à l'exécution de cette obligation comme si elle était une autorité responsable. S'agissant d'une autorité fédérale visée à l'alinéa b) de la définition de « autorité fédérale », au paragraphe 2(1), elle peut s'acquitter de cette obligation avec l'agrément du ministre par l'intermédiaire duquel elle rend compte de ses activités au Parlement.

Application du
paragraphe 5(2)

Approval of
Governor in
Council

(1.3) Where a project is referred back to a responsible authority under subsection 23(1) and the Minister issues an environmental assessment decision statement to the effect that the project is likely to cause significant adverse environmental effects, no course of action may be taken by the responsible authority under subsection (1) without the approval of the Governor in Council.

(1.3) L'autorité responsable à laquelle le projet est renvoyé au titre du paragraphe 23(1) ne prend la décision visée au paragraphe (1) qu'avec l'agrément du gouverneur en conseil si le projet est, selon la déclaration du ministre, susceptible d'entraîner des effets environnementaux négatifs importants.

Agrément du
gouverneur en
conseil

Responsible authority to ensure implementation of mitigation measures	(2) Where a responsible authority takes a course of action referred to in paragraph (1)(a), it shall, notwithstanding any other Act of Parliament, in the exercise of its powers or the performance of its duties or functions under that other Act or any regulation made thereunder or in any other manner that the responsible authority considers necessary, ensure that any mitigation measures referred to in that paragraph in respect of the project are implemented.	(2) L'autorité responsable qui prend la décision visée à l'alinéa (1)a) veille, malgré toute autre loi fédérale, lors de l'exercice des attributions qui lui sont conférées sous le régime de cette loi ou de ses règlements ou selon les autres modalités qu'elle estime indiquées, à l'application des mesures d'atténuation visées à cet alinéa.	Précision
Mitigation measures — extent of authority	(2.1) Mitigation measures that may be taken into account under subsection (1) by a responsible authority are not limited to measures within the legislative authority of Parliament and include (a) any mitigation measures whose implementation the responsible authority can ensure; and (b) any other mitigation measures that it is satisfied will be implemented by another person or body.	(2.1) Les mesures d'atténuation que l'autorité responsable peut prendre en compte dans le cadre du paragraphe (1) ne se limitent pas à celles qui relèvent de la compétence législative du Parlement; elles comprennent : a) les mesures d'atténuation dont elle peut assurer l'application; b) toute autre mesure d'atténuation dont elle est convaincue qu'elle sera appliquée par une autre personne ou un autre organisme.	Mesures d'atténuation — étendue des pouvoirs
Responsible authority to ensure implementation of mitigation measures	(2.2) When a responsible authority takes a course of action referred to in paragraph (1)(a), it shall, with respect to any mitigation measures it has taken into account and that are described in paragraph (2.1)(a), ensure their implementation in any manner that it considers necessary and, in doing so, it is not limited to its duties or powers under any other Act of Parliament.	(2.2) Si elle prend une décision dans le cadre de l'alinéa (1)a), l'autorité responsable veille à l'application des mesures d'atténuation qu'elle a prises en compte et qui sont visées à l'alinéa (1.1)a) de la façon qu'elle estime nécessaire, même si aucune autre loi fédérale ne lui confère de tels pouvoirs d'application.	Application des mesures d'atténuation
Assistance of other federal authority	(2.3) A federal authority shall provide any assistance requested by a responsible authority in ensuring the implementation of a mitigation measure on which the federal authority and the responsible authority have agreed.	(2.3) Il incombe à l'autorité fédérale qui convient avec l'autorité responsable de mesures d'atténuation d'appuyer celle-ci, sur demande, dans l'application de ces mesures.	Appui à l'autorité responsable
Prohibition: proceeding with project	(3) Where the responsible authority takes a course of action referred to in paragraph (1)(b) in relation to a project, the responsible authority shall publish a notice of that course of action in the Registry and, notwithstanding any other Act of Parliament, no power, duty or function conferred by or under that Act or any regulation made under it shall be exercised or performed that would permit that project to be carried out in whole or in part.	(3) L'autorité responsable qui prend la décision visée à l'alinéa (1)b) à l'égard d'un projet est tenue de publier un avis de cette décision dans le registre, et aucune attribution conférée sous le régime de toute autre loi fédérale ou de ses règlements ne peut être exercée de façon à permettre la mise en œuvre, en tout ou en partie, du projet.	Interdiction de mise en œuvre
Time for decision	(4) A responsible authority shall not take any course of action under subsection (1) before the 30th day after the report submitted by a mediator or a review panel or a summary of it	(4) L'autorité responsable ne peut prendre une décision dans le cadre du paragraphe (1) avant le trentième jour suivant le versement du rapport du médiateur ou de la commission, ou	Délai relatif à la prise de la décision

has been included on the Internet site in accordance with paragraph 55.1(2)(p).

1992, c. 37, s. 37; 1993, c. 34, s. 29(F); 1994, c. 46, s. 3; 2003, c. 9, s. 17.

FOLLOW-UP PROGRAM

Consideration of follow-up — decision under paragraph 20(1)(a)

38. (1) Where a responsible authority takes a course of action under paragraph 20(1)(a), it shall consider whether a follow-up program for the project is appropriate in the circumstances and, if so, shall design a follow-up program and ensure its implementation.

Mandatory follow-up — decision under paragraph 37(1)(a)

(2) Where a responsible authority takes a course of action under paragraph 37(1)(a), it shall design a follow-up program for the project and ensure its implementation.

Scope of follow-up program

(3) In designing a follow-up program and in ensuring its implementation, a responsible authority is not limited by the Act of Parliament that confers the powers it exercises or the duties or functions it performs.

Assistance of other federal authority

(4) A federal authority shall provide any assistance requested by a responsible authority in ensuring the implementation of a follow-up program on which the federal authority and the responsible authority have agreed.

Follow-up programs

(5) The results of follow-up programs may be used for implementing adaptive management measures or for improving the quality of future environmental assessments.

1992, c. 37, s. 38; 1993, c. 34, s. 30(F); 2003, c. 9, s. 18.

CERTIFICATE

Certificate

39. A certificate that states that an environmental assessment of a project has been completed, and that is signed by a responsible authority that exercises a power or performs a duty or function referred to in paragraph 5(1)(c) in relation to the project, is, in the absence of evidence to the contrary, proof of the matter stated.

JOINT REVIEW PANELS

Definition of “jurisdiction”

40. (1) For the purposes of this section and sections 41 and 42, “jurisdiction” includes

- (a) a federal authority;
- (b) the government of a province;

un résumé du rapport, au site Internet conformément à l’alinéa 55.1(2)p).

1992, ch. 37, art. 37; 1993, ch. 34, art. 29(F); 1994, ch. 46, art. 3; 2003, ch. 9, art. 17.

PROGRAMME DE SUIVI

38. (1) Si elle décide de la mise en œuvre conformément à l’alinéa 20(1)a), l’autorité responsable examine l’opportunité d’un programme de suivi dans les circonstances; le cas échéant, elle procède à l’élaboration d’un tel programme et veille à son application.

(2) Si elle décide de la mise en œuvre conformément à l’alinéa 37(1)a), l’autorité responsable élabore un programme de suivi et veille à son application.

(3) Dans l’élaboration et l’application du programme de suivi qu’elle estime indiqué, l’autorité responsable n’est pas limitée par le champ d’application de la loi sous le régime de laquelle elle exerce ses attributions.

(4) Il incombe à l’autorité fédérale qui convient avec l’autorité responsable du programme de suivi d’appuyer celle-ci, sur demande, dans la mise en œuvre du programme.

(5) Les résultats des programmes de suivi peuvent être utilisés pour mettre en œuvre des mesures de gestion adaptative ou pour améliorer la qualité des évaluations environnementales futures.

1992, ch. 37, art. 38; 1993, ch. 34, art. 30(F); 2003, ch. 9, art. 18.

CERTIFICAT

39. Le certificat signé par l’autorité responsable qui exerce une attribution visée à l’alinéa 5(1)c) et où il est déclaré qu’une évaluation environnementale a été effectuée fait foi, sauf preuve contraire, de son contenu.

EXAMEN CONJOINT

40. (1) Pour l’application du présent article et des articles 41 et 42, « instance » s’entend notamment :

- a) d’une autorité fédérale;
- b) du gouvernement d’une province;

Décision au titre de l’al. 20(1)a) : suivi

Décision au titre de l’al. 37(1)a) : suivi

Portée du programme de suivi

Appui à l’autorité responsable

Programme de suivi

Certificat d’évaluation environnementale

Définition d’« instance »

(c) any other agency or body established pursuant to an Act of Parliament or the legislature of a province and having powers, duties or functions in relation to an assessment of the environmental effects of a project;

(d) any body established pursuant to a land claims agreement referred to in section 35 of the *Constitution Act, 1982* and having powers, duties or functions in relation to an assessment of the environmental effects of a project;

(e) a government of a foreign state or of a subdivision of a foreign state, or any institution of such a government; and

(f) an international organization of states or any institution of such an organization.

(2) Subject to section 41, where the referral of a project to a review panel is required or permitted by this Act, the Minister

(a) may enter into an agreement or arrangement with a jurisdiction referred to in paragraph (1)(a), (b), (c) or (d) that has powers, duties or functions in relation to the assessment of the environmental effects of the project, respecting the joint establishment of a review panel and the manner in which the environmental assessment of the project is to be conducted by the review panel; and

(b) shall, in the case of a jurisdiction within the meaning of subsection 12(5) that has a responsibility or an authority to conduct an assessment of the environmental effects of the project or any part of it, offer to consult and cooperate with that other jurisdiction respecting the environmental assessment of the project.

(2.1) Subject to section 41, where the Minister is required by subsection 28(2) to refer a proposal to a review panel, the Minister and the Mackenzie Valley Environmental Impact Review Board shall, in writing, jointly establish a review panel and prescribe the manner of its examination of the impact of the proposal on the environment.

(2.2) Despite subsection (2.1), if, in respect of a proposal referred to in subsection 138.1(1) of the *Mackenzie Valley Resource Management*

c) de tout autre organisme établi sous le régime d'une loi provinciale ou fédérale ayant des attributions relatives à l'évaluation des effets environnementaux d'un projet;

d) de tout organisme, constitué aux termes d'un accord sur des revendications territoriales visé à l'article 35 de la *Loi constitutionnelle de 1982*, ayant des attributions relatives à l'évaluation des effets environnementaux d'un projet;

e) du gouvernement d'un État étranger, d'une subdivision politique d'un État étranger ou de l'un de leurs organismes;

f) d'une organisation internationale d'États ou de l'un de ses organismes.

(2) Sous réserve de l'article 41, dans le cas où il estime qu'un examen par une commission est nécessaire ou possible, le ministre :

a) peut conclure avec l'instance visée à l'alinéa (1)a), b), c) ou d) exerçant des attributions relatives à l'évaluation des effets environnementaux du projet un accord relatif à la constitution conjointe d'une commission et aux modalités de l'évaluation environnementale du projet par celle-ci;

b) est tenu, dans le cas d'une instance, au sens du paragraphe 12(5), qui a la responsabilité ou le pouvoir d'entreprendre l'évaluation des effets environnementaux de tout ou partie du projet, d'offrir de consulter et de coopérer avec celle-ci à l'égard de l'évaluation environnementale du projet.

(2.1) Sous réserve de l'article 41, dans les cas où il est tenu de soumettre l'affaire à un examen par une commission au titre du paragraphe 28(2), le ministre, de concert avec l'Office d'examen des répercussions environnementales de la vallée du Mackenzie, procède à la constitution d'une commission conjointe et fixe, dans le document constitutif, les modalités d'examen des effets environnementaux du projet par celle-ci.

(2.2) Malgré le paragraphe (2.1), faute de conclusion, dans le délai réglementaire prévu au paragraphe 138.1(4) de la *Loi sur la gestion*

Review panels established jointly with another jurisdiction

Examen conjoint

Mackenzie Valley Resource Management Act

Loi sur la gestion des ressources de la vallée du Mackenzie

Where no agreement

Examen par une commission en l'absence d'un accord

Act, no agreement is entered into under that subsection within the period fixed by the regulations referred to in subsection 138.1(4) of that Act, an assessment by a review panel of the proposal shall be conducted.

des ressources de la vallée du Mackenzie, de l'accord prévu au paragraphe 138.1(1) de cette loi, le projet visé à ce paragraphe fait l'objet d'un examen par une commission.

Coordination

(2.3) The Minister shall to the extent possible ensure that any assessment of the proposal required by subsection (2.2) is coordinated with any environmental impact review of the proposal under the *Mackenzie Valley Resource Management Act*.

(2.3) Le ministre veille, dans la mesure du possible, à ce que l'examen visé au paragraphe (2.2) soit coordonné avec toute étude d'impact du projet effectuée en vertu de la *Loi sur la gestion des ressources de la vallée du Mackenzie*.

Coordination de l'examen avec toute étude d'impact

Consultation

(2.4) Before taking a course of action under subsection 37(1) in respect of a proposal referred to in subsection (2.3), the responsible authority shall take into consideration any report in respect of the proposal that is issued under subsection 134(2) of the *Mackenzie Valley Resource Management Act* and shall consult the persons and bodies to whom the report is submitted or distributed under subsection 134(3) of that Act.

(2.4) Avant de prendre la décision visée au paragraphe 37(1) à l'égard du projet visé au paragraphe (2.3), l'autorité responsable tient compte de tout rapport établi en vertu du paragraphe 134(2) de la *Loi sur la gestion des ressources de la vallée du Mackenzie* à l'égard du projet et consulte les personnes et organismes qui doivent recevoir le rapport aux termes du paragraphe 134(3) de cette loi.

Consultation

Review panels established jointly with another jurisdiction

(3) Subject to section 41, where the referral of a project to a review panel is required or permitted by this Act and a jurisdiction referred to in paragraph (1)(e) or (f) has a responsibility or an authority to conduct an assessment of the environmental effects of the project or any part of it, the Minister and the Minister of Foreign Affairs may enter into an agreement or arrangement with that jurisdiction respecting the joint establishment of a review panel and the manner in which the environmental assessment of the project is to be conducted by the review panel.

(3) Sous réserve de l'article 41, dans le cas où ils estiment qu'un examen par une commission est nécessaire ou possible et où une instance visée aux alinéas (1)e) ou f) a la responsabilité ou le pouvoir d'entreprendre l'évaluation des effets environnementaux de tout ou partie du projet, le ministre et le ministre des Affaires étrangères peuvent conclure avec l'instance visée un accord relatif à la constitution conjointe d'une commission et aux modalités de l'évaluation environnementale du projet par celle-ci.

Examen conjoint

Publication of agreement for joint panel

(4) Any agreement or arrangement referred to in subsection (2) or (3), and any document establishing a review panel under subsection (2.1), shall be published before the commencement of the hearings conducted by the review panel.

(4) Les accords visés aux paragraphes (2) ou (3), ainsi que les documents visés au paragraphe (2.1), sont publiés avant le début des audiences de la commission conjointe.

Publicité

1992, c. 37, s. 40; 1993, c. 34, s. 31(F); 1995, c. 5, s. 25; 1998, c. 25, s. 163; 2003, c. 9, s. 19; 2005, c. 1, s. 99.

1992, ch. 37, art. 40; 1993, ch. 34, art. 31(F); 1995, ch. 5, art. 25; 1998, ch. 25, art. 163; 2003, ch. 9, art. 19; 2005, ch. 1, art. 99.

Conditions

41. An agreement or arrangement entered into pursuant to subsection 40(2) or (3), and any document establishing a review panel under subsection 40(2.1), shall provide that the environmental assessment of the project shall include a consideration of the factors required to be considered under subsections 16(1) and (2) and be conducted in accordance with any additional requirements and procedures set out in the agreement and shall provide that

41. Les accords conclus aux termes des paragraphes 40(2) ou (3) et les documents visés au paragraphe 40(2.1) contiennent une disposition selon laquelle l'évaluation environnementale du projet prend en compte les éléments prévus aux paragraphes 16(1) et (2) et est effectuée conformément aux exigences et modalités supplémentaires qui y sont contenues ainsi que les conditions suivantes :

Conditions de l'examen conjoint

- (a) the Minister shall appoint or approve the appointment of the chairperson or appoint a co-chairperson, and shall appoint at least one other member of the panel;
- (b) the members of the panel are to be unbiased and free from any conflict of interest relative to the project and are to have knowledge or experience relevant to the anticipated environmental effects of the project;
- (c) the Minister shall fix or approve the terms of reference for the panel;
- (d) the review panel is to have the powers and immunities provided for in section 35;
- (e) the public will be given an opportunity to participate in the assessment conducted by the panel;
- (f) on completion of the assessment, the report of the panel will be submitted to the Minister; and
- (g) the panel's report will be published.

1992, c. 37, s. 41; 1993, c. 34, s. 32(F); 1998, c. 25, s. 164; 2003, c. 9, s. 20.

Deemed substitution

42. Where the Minister establishes a review panel jointly with a jurisdiction referred to in subsection 40(1), the assessment conducted by that panel shall be deemed to satisfy any requirements of this Act and the regulations respecting assessments by a review panel.

1992, c. 37, s. 42; 1993, c. 34, s. 33(F).

PUBLIC HEARING BY A FEDERAL AUTHORITY

Substitute for review panel

43. (1) Where the referral of a project to a review panel is required or permitted by this Act and the Minister is of the opinion that a process for assessing the environmental effects of projects that is followed by a federal authority under an Act of Parliament other than this Act or by a body referred to in paragraph 40(1) (d) would be an appropriate substitute, the Minister may approve the substitution of that process for an environmental assessment by a review panel under this Act.

Manner of approval

(2) An approval of the Minister pursuant to subsection (1) shall be in writing and may be given in respect of a project or a class of projects.

1992, c. 37, s. 43; 1993, c. 34, s. 34(F).

- a) le ministre nomme le président, ou approuve sa nomination, ou nomme le coprésident et nomme au moins un autre membre de la commission;
- b) les membres de la commission sont impartiaux, non en conflit d'intérêts avec le projet et pourvus des connaissances et de l'expérience voulues touchant les effets environnementaux prévus du projet;
- c) le ministre fixe ou approuve le mandat de la commission;
- d) les pouvoirs et immunités prévus à l'article 35 sont conférés à la commission;
- e) le public aura la possibilité de participer à l'examen;
- f) dès l'achèvement de l'examen, la commission lui présentera un rapport;
- g) le rapport sera publié.

1992, ch. 37, art. 41; 1993, ch. 34, art. 32(F); 1998, ch. 25, art. 164; 2003, ch. 9, art. 20.

42. Dans le cas où le ministre constitue la commission visée au paragraphe 40(1), l'examen effectué par celle-ci est réputé satisfaire aux exigences de la présente loi et des règlements en matière d'évaluation environnementale effectuée par une commission.

1992, ch. 37, art. 42; 1993, ch. 34, art. 33(F).

AUDIENCE PUBLIQUE PAR UNE AUTORITÉ FÉDÉRALE

Examen réputé conforme

43. (1) Dans le cas où la présente loi lui permet de demander un examen par une commission ou l'y oblige, et s'il estime que le processus d'évaluation des effets environnementaux suivi par une autorité fédérale sous le régime d'une autre loi fédérale ou par un organisme visé à l'alinéa 40(1)d) serait indiqué dans les circonstances, le ministre peut autoriser la substitution de ce processus d'évaluation à l'examen.

Substitution

(2) L'autorisation du ministre est donnée par écrit et peut viser un projet ou une catégorie de projets.

1992, ch. 37, art. 43; 1993, ch. 34, art. 34(F).

Modalités

Conditions	<p>44. The Minister shall not approve a substitution pursuant to subsection 43(1) unless the Minister is satisfied that</p> <ul style="list-style-type: none"> (a) the process to be substituted will include a consideration of the factors required to be considered under subsections 16(1) and (2); (b) the public will be given an opportunity to participate in the assessment; (c) at the end of the assessment, a report will be submitted to the Minister; (d) the report will be published; and (e) any criteria established pursuant to paragraph 58(1)(g) are met. 	<p>44. Le ministre ne peut autoriser la substitution que s'il est convaincu que les conditions suivantes sont réunies :</p> <ul style="list-style-type: none"> a) l'évaluation à effectuer portera entre autres sur les éléments dont la prise en compte est exigée en vertu des paragraphes 16(1) et (2); b) le public aura la possibilité de participer au processus d'évaluation; c) dès l'achèvement de l'évaluation, un rapport lui sera présenté; d) le rapport sera publié; e) il a été satisfait aux critères fixés aux termes de l'alinéa 58(1)g). 	Conditions
Deemed substitution	<p>45. Where the Minister approves a substitution of a process pursuant to subsection 43(1), an assessment that is conducted in accordance with that process shall be deemed to satisfy any requirements of this Act and the regulations in respect of assessments by a review panel.</p>	<p>45. L'évaluation autorisée en application du paragraphe 43(1) est réputée satisfaire aux exigences de la présente loi et des règlements en matière d'évaluation environnementale effectuée par une commission.</p>	Évaluation réputée conforme
	<p>TRANSBOUNDARY AND RELATED ENVIRONMENTAL EFFECTS</p>	<p>EFFETS HORS FRONTIÈRES ET EFFETS ENVIRONNEMENTAUX CONNEXES</p>	
Transboundary and related environmental effects	<p>46. (1) Where no power, duty or function referred to in section 5 is to be exercised or performed by a federal authority in relation to a project that is to be carried out in a province and the Minister is of the opinion that the project may cause significant adverse environmental effects in another province, the Minister may refer the project to a mediator or a review panel in accordance with section 29 for an assessment of the environmental effects of the project in that other province.</p>	<p>46. (1) S'il est d'avis qu'un projet qui doit être mis en œuvre dans une province et à l'égard duquel aucune des attributions visées à l'article 5 ne doit être exercée par une autorité fédérale peut entraîner des effets environnementaux négatifs importants dans une autre province, le ministre peut, conformément à l'article 29, renvoyer à un médiateur ou à une commission l'évaluation de ces effets dans cette autre province.</p>	Effets interprovinciaux
Agreement	<p>(2) The Minister shall not refer a project to a mediator or a review panel pursuant to subsection (1) where the Minister and the governments of all interested provinces have agreed on another manner of conducting an assessment of the interprovincial environmental effects of the project that</p> <ul style="list-style-type: none"> (a) includes a consideration of the factors required to be considered under subsections 16(1) and (2); (b) includes an opportunity for the public to participate in the assessment; 	<p>(2) Le ministre ne peut effectuer le renvoi prévu au paragraphe (1) que si lui-même et les gouvernements des provinces concernées ne peuvent s'entendre sur des modalités de rechange de l'évaluation des effets environnementaux interprovinciaux du projet qui réunissent les conditions suivantes :</p> <ul style="list-style-type: none"> a) l'évaluation porte sur les éléments dont la prise en compte est exigée en vertu des paragraphes 16(1) et (2); b) le public a la possibilité de participer au processus d'évaluation; c) dès l'achèvement de l'évaluation, un rapport lui sera présenté; 	Entente interprovinciale

	<p>(c) includes a requirement that the report is to be submitted to the Minister at the end of the assessment;</p> <p>(d) includes a requirement that the report is to be published; and</p> <p>(e) meets any criteria established pursuant to paragraph 58(1)(h).</p>	<p>d) le rapport sera publié;</p> <p>e) l'évaluation satisfait aux critères établis aux termes de l'alinéa 58(1)h).</p>	
Initiative for reference	<p>(3) The Minister shall consider whether to make a reference pursuant to subsection (1)</p> <p>(a) on the request of the government of any interested province; or</p> <p>(b) on the receipt of a petition that is</p> <p>(i) signed by one or more persons each of whom has an interest in lands on which the project may cause significant adverse environmental effects, and</p> <p>(ii) accompanied by a concise statement of the evidence supporting the contention of the petitioners that the project may cause significant adverse environmental effects in a province other than the one in which it is to be carried out.</p>	<p>(3) Le ministre est tenu d'examiner la possibilité d'effectuer le renvoi prévu au paragraphe (1) :</p> <p>a) à la demande du gouvernement d'une province concernée;</p> <p>b) sur réception d'une pétition signée par une ou plusieurs personnes qui ont chacune des droits sur des terres sur lesquelles le projet peut entraîner des effets environnementaux négatifs importants et accompagnée d'un bref exposé alléguant que la mise en oeuvre du projet dans une province peut causer de tels effets dans une autre province.</p>	Initiative
Notice	<p>(4) At least ten days before referring a project to a mediator or a review panel pursuant to subsection (1), the Minister shall give notice of the intention to do so to the proponent of the project, to the governments of all interested provinces and to any person who signed a petition considered by the Minister pursuant to subsection (3).</p>	<p>(4) Avant d'effectuer le renvoi prévu au paragraphe (1), le ministre en donne un préavis d'au moins dix jours au promoteur du projet, à tous les gouvernements des provinces concernées et aux signataires de la pétition reçue aux termes du paragraphe (3).</p>	Avis
Meaning of "interested province"	<p>(5) For the purposes of this section and sections 47, 48, 50 and 51, "interested province" means</p> <p>(a) a province in which the project is to be carried out; or</p> <p>(b) a province that claims that significant adverse environmental effects may occur in that province as a result of the project.</p> <p>1992, c. 37, s. 46; 2003, c. 9, s. 21.</p>	<p>(5) Pour l'application du présent article et des articles 47, 48, 50 et 51, « province concernée » s'entend de la province où est mis en oeuvre le projet et de celle qui prétend que le projet peut entraîner des effets environnementaux négatifs importants sur son territoire.</p> <p>1992, ch. 37, art. 46; 2003, ch. 9, art. 21.</p>	Définition de « province concernée »
International environmental effects	<p>47. (1) Where no power, duty or function referred to in section 5 is to be exercised or performed by a federal authority in relation to a project that is to be carried out in Canada or on federal lands and the Minister is of the opinion that the project may cause significant adverse environmental effects occurring both outside Canada and outside those federal lands, the</p>	<p>47. (1) Dans le cas où aucune des attributions visées à l'article 5 ne doit être exercée par une autorité fédérale à l'égard d'un projet devant être mis en oeuvre au Canada ou sur le territoire domanial et où le ministre est d'avis que le projet peut entraîner des effets environnementaux négatifs importants à la fois à l'étranger et hors du territoire domanial, le ministre et</p>	Effets internationaux

Minister and the Minister of Foreign Affairs may refer the project to a mediator or a review panel in accordance with section 29 for an assessment of the environmental effects of the project occurring both outside Canada and outside federal lands.

le ministre des Affaires étrangères peuvent, conformément à l'article 29, renvoyer à un médiateur ou à une commission l'évaluation des effets environnementaux internationaux.

Agreement

(2) The Minister and the Minister of Foreign Affairs shall not refer a project to a mediator or a review panel pursuant to subsection (1) where the Minister and the governments of all interested provinces have agreed on another manner of conducting an assessment of the environmental effects of the project occurring both outside Canada and outside federal lands that

(2) Le ministre et le ministre des Affaires étrangères ne peuvent effectuer le renvoi prévu au paragraphe (1) que si le ministre et les gouvernements des provinces concernées ne peuvent s'entendre sur des modalités de rechange de l'évaluation des effets environnementaux du projet qui surviennent à la fois à l'étranger et hors du territoire domanial et que si ces modalités de rechange réunissent les conditions suivantes :

Défaut d'entente

(a) includes a consideration of the factors required to be considered under subsections 16(1) and (2);

a) elles portent sur les éléments dont la prise en compte est exigée en vertu des paragraphes 16(1) et (2);

(b) includes an opportunity for the public to participate in the assessment;

b) le public a la possibilité de participer au processus d'évaluation;

(c) includes a requirement that the report is to be submitted to the Minister at the end of the assessment;

c) dès son achèvement, un rapport sera présenté au ministre;

(d) includes a requirement that the report is to be published; and

d) le rapport sera publié;

(e) meets any criteria established pursuant to paragraph 58(1)(h).

e) elles satisfont aux critères fixés aux termes de l'alinéa 58(1)h).

Initiative for reference

(3) On a request to the Minister to refer a project to a mediator or a review panel pursuant to subsection (1) made by

(3) Le ministre et le ministre des Affaires étrangères sont tenus d'examiner la possibilité d'effectuer le renvoi prévu au paragraphe (1) sur réception par le ministre d'une demande présentée soit par le gouvernement d'une province où doit être mis en oeuvre le projet ou dont le territoire est contigu au territoire domanial sur lequel le projet doit être mis en oeuvre, soit par le gouvernement d'un État étranger ou d'une subdivision politique d'un État étranger qui allègue que le projet peut entraîner des effets environnementaux négatifs importants sur son territoire.

Demande

(a) the government of any province in which the project is to be carried out or that is adjacent to federal lands on which the project is to be carried out, or

(b) the government of a foreign state or a subdivision thereof that claims that significant adverse environmental effects may occur in that foreign state or subdivision thereof as a result of the project,

the Minister and the Minister of Foreign Affairs shall consider whether to make a reference pursuant to subsection (1).

Notice

(4) At least ten days before making a reference pursuant to subsection (1), the Minister shall give notice of the intention to do so to

(4) Avant d'effectuer le renvoi prévu au paragraphe (1), le ministre en donne un préavis d'au moins dix jours :

Préavis

(a) the proponent of the project;

a) au promoteur du projet;

(b) the government of any province in which the project is to be carried out or that is adjacent to federal lands on which the project is to be carried out,

b) au gouvernement de la province où est mis en oeuvre le projet ou dont le territoire

cent to federal lands on which the project is to be carried out; and

(c) the government of any foreign state or a subdivision thereof in which, in the opinion of the Minister, significant adverse environmental effects may occur as a result of the project.

1992, c. 37, s. 47; 1995, c. 5, s. 25; 2003, c. 9, s. 22.

Environmental effects of projects carried out on lands of federal interest

48. (1) Where no power, duty or function referred to in section 5 is to be exercised or performed by a federal authority in relation to a project that is to be carried out in Canada and the Minister is of the opinion that the project may cause significant adverse environmental effects on

(a) lands in a reserve that is set apart for the use and benefit of a band and that is subject to the *Indian Act*,

(a.1) a park or park reserve as defined in subsection 2(1) of the *Canada National Parks Act*,

(b) federal lands other than those mentioned in paragraph (a) or (a.1),

(c) lands that are described in a land claims agreement referred to in section 35 of the *Constitution Act, 1982* and that are prescribed,

(d) lands that have been set aside for the use and benefit of Indians pursuant to legislation that relates to the self-government of Indians and that are prescribed, or

(e) lands in respect of which Indians have interests,

the Minister may refer the project to a mediator or a review panel in accordance with section 29 for an assessment of the environmental effects of the project on those lands.

Ecological integrity

(1.1) In deciding whether or not a project may cause significant adverse environmental effects on a park or park reserve as defined in subsection 2(1) of the *Canada National Parks Act*, the Minister shall take into account its ecological integrity, as that expression is defined in that subsection.

est contigu au territoire domanial sur lequel le projet est mis en oeuvre;

c) au gouvernement de l'État étranger à l'égard duquel, ou à la subdivision politique du gouvernement d'un État étranger à l'égard de laquelle, selon le ministre, le projet peut entraîner des effets environnementaux négatifs importants sur son territoire.

1992, ch. 37, art. 47; 1995, ch. 5, art. 25; 2003, ch. 9, art. 22.

48. (1) Le ministre peut renvoyer à un médiateur ou à une commission l'évaluation des effets environnementaux d'un projet à l'égard duquel aucune attribution visée à l'article 5 ne doit être exercée par une autorité fédérale, si le projet doit être mis en œuvre au Canada et peut, à son avis, entraîner des effets environnementaux négatifs importants sur :

a) des terres d'une réserve mise de côté à l'usage et au profit d'une bande et assujettie à la *Loi sur les Indiens*;

a.1) un parc ou une réserve, au sens du paragraphe 2(1) de la *Loi sur les parcs nationaux du Canada*;

b) le territoire domanial, à l'exception des terres visées aux alinéas a) et a.1);

c) des terres visées dans un accord de revendications territoriales visé à l'article 35 de la *Loi constitutionnelle de 1982* et désignées par règlement;

d) des terres, désignées par règlement, mises de côté à l'usage et au profit des Indiens conformément à une loi relative à l'autonomie gouvernementale des Indiens;

e) des terres sur lesquelles les Indiens ont des droits.

Territoire domanial et autre

(1.1) Le ministre, pour décider si un projet peut entraîner des effets environnementaux négatifs importants sur un parc ou une réserve, au sens du paragraphe 2(1) de la *Loi sur les parcs nationaux du Canada*, tient compte des effets que le projet aura sur leur intégrité écologique, au sens de ce paragraphe.

Intégrité écologique

Environmental effects of projects carried out on reserve lands, etc.

(2) Where no power, duty or function referred to in section 5 is to be exercised or performed by a federal authority in relation to a project that is to be carried out on

(a) lands in a reserve that is set apart for the use and benefit of a band and that is subject to the *Indian Act*,

(b) lands that are described in a land claims agreement referred to in section 35 of the *Constitution Act, 1982* and that are prescribed, or

(c) lands that have been set aside for the use and benefit of Indians pursuant to legislation that relates to the self-government of Indians and that are prescribed,

and the Minister is of the opinion that the project may cause significant adverse environmental effects outside those lands, the Minister may refer the project to a mediator or a review panel in accordance with section 29 for an assessment of the environmental effects of the project outside those lands.

Agreement

(3) The Minister shall not refer a project to a mediator or a review panel pursuant to subsection (1) or (2) where the Minister and the governments of all interested provinces, and

(a) in respect of federal lands referred to in paragraph (1)(b), the federal authority having the administration of those lands,

(b) in respect of lands referred to in paragraph (1)(a) or (2)(a), the council of the band for whose use and benefit the reserve has been set apart,

(c) in respect of lands referred to in paragraph (1)(c) or (e) or (2)(b), the party to the agreement or claim — or that party's successor — that was, or was acting on behalf of, an aboriginal people or group, or

(d) in respect of lands that have been set aside for the use and benefit of Indians pursuant to legislation referred to in paragraph (1)(d) or (2)(c), the governing body established by that legislation,

have agreed on another manner of conducting an assessment of the environmental effects of the project on or outside those lands, as the case may be.

Terres d'une réserve et autres

(2) S'il est d'avis qu'un projet à l'égard duquel aucune attribution visée à l'article 5 ne doit être exercée par une autorité fédérale et qui doit être mis en œuvre sur les terres énumérées ci-après peut entraîner des effets environnementaux négatifs importants à l'extérieur de ces terres, le ministre peut, conformément à l'article 29, renvoyer à un médiateur ou à une commission l'examen de ces effets :

a) terres d'une réserve mise de côté à l'usage et au profit d'une bande et assujettie à la *Loi sur les Indiens*;

b) terres visées dans un accord de revendications territoriales visé à l'article 35 de la *Loi constitutionnelle de 1982* et désignées par règlement;

c) terres, désignées par règlement, qui ont été mises de côté à l'usage et au profit des Indiens conformément à une loi relative à l'autonomie gouvernementale des Indiens.

Défaut d'entente

(3) Le ministre ne peut effectuer le renvoi prévu aux paragraphes (1) ou (2) que si lui-même et les gouvernements des provinces concernées ainsi que les organismes énumérés ci-après ne peuvent s'entendre sur les modalités de rechange de l'évaluation des effets environnementaux négatifs importants du projet sur ces terres ou à l'extérieur de celles-ci :

a) à l'égard du territoire domanial visé à l'alinéa (1)b), l'autorité fédérale qui est chargée de sa gestion;

b) à l'égard des terres visées aux alinéas (1)a) ou (2)a), le conseil de la bande à l'usage et au profit de laquelle la réserve a été mise de côté;

c) à l'égard des terres visées aux alinéas (1)c) ou e) ou (2)b), le peuple ou groupe autochtone, ou son représentant, partie à l'accord ou à la revendication, ou leurs successeurs;

d) à l'égard des terres qui ont été mises de côté à l'usage et au profit des Indiens conformément à une loi visée aux alinéas (1)d) ou (2)c), l'organisme dirigeant constitué par cette loi.

Initiative for
reference

(4) The Minister shall consider whether to make a reference pursuant to subsection (1) or (2)

(a) on the request of the government of any interested province or the federal authority having the administration of federal lands referred to in paragraph (1)(b); or

(b) on receipt of a petition that is

(i) signed by one or more persons each of whom has an interest in lands on which the project may cause significant adverse environmental effects, and

(ii) accompanied by a concise statement of the evidence supporting the contention of the petitioner that the project may cause significant adverse environmental effects in respect of which a reference may be made pursuant to subsection (1) or (2).

Notice

(5) At least ten days before a reference is made pursuant to subsection (1) or (2), the Minister shall give notice of the intention to do so to

(a) the proponent of the project;

(b) the governments of all interested provinces;

(c) any person who signed a petition considered by the Minister pursuant to subsection (4);

(d) the federal authority, in the case of a reference to be made pursuant to paragraph (1)(b);

(e) in respect of lands referred to in paragraph (1)(a) or (2)(a), the council of the band for whose use and benefit the reserve has been set apart;

(f) in respect of lands referred to in paragraph (1)(c) or (e) or (2)(b), the party to the agreement or claim — or that party's successor — that was, or was acting on behalf of, an aboriginal people or group; and

(g) in respect of lands that have been set aside for the use and benefit of Indians pursuant to legislation referred to in paragraph (1)(d) or (2)(c), the governing body established by that legislation.

(4) Le ministre est tenu d'examiner la possibilité d'effectuer le renvoi prévu aux paragraphes (1) ou (2) :

a) à la demande du gouvernement d'une province concernée ou de l'autorité fédérale chargée de la gestion du territoire domanial visé à l'alinéa (1)b);

b) sur réception d'une pétition :

(i) signée par une ou plusieurs personnes qui ont chacune des droits sur des terres où le projet peut entraîner des effets environnementaux négatifs importants,

(ii) accompagnée d'un bref exposé alléguant que la mise en oeuvre du projet dans une province peut causer de tels effets, à l'égard desquels un renvoi peut être effectué aux termes des paragraphes (1) ou (2).

Demande

(5) Avant d'effectuer le renvoi prévu aux paragraphes (1) ou (2), le ministre en donne un préavis d'au moins dix jours :

a) au promoteur du projet;

b) aux gouvernements des provinces concernées;

c) aux signataires d'une pétition examinée par le ministre aux termes du paragraphe (4);

d) à l'autorité fédérale, dans le cas du renvoi qui doit être effectué aux termes de l'alinéa (1)b);

e) à l'égard des terres visées aux alinéas (1)a) ou (2)a), au conseil de la bande à l'usage et au profit de laquelle la réserve a été mise de côté;

f) à l'égard des terres visées aux alinéas (1)c) ou e) ou (2)b), au peuple ou groupe autochtone, ou à son représentant, partie à l'accord ou à la revendication, ou à leurs successeurs;

g) à l'égard des terres qui ont été mises de côté à l'usage et au profit des Indiens conformément à une loi visée aux alinéas (1)d) ou (2)c), à l'organisme dirigeant constitué par cette loi.

Préavis

Meaning of “lands in respect of which Indians have interests”	<p>(6) For the purposes of this section, “lands in respect of which Indians have interests” means</p> <p>(a) land areas that are subject to a land claim accepted by the Government of Canada for negotiation under its comprehensive land claims policy and that</p> <p>(i) for the purposes of land claim settlement have been withdrawn from disposal, under the <i>Territorial Lands Act</i> in the case of land areas situated in the Northwest Territories or Nunavut, or under a law of the Legislature of Yukon in the case of land areas situated in Yukon, or</p> <p>(ii) in the case of land areas situated in a province, have been agreed on for selection by the Government of Canada and the government of the province; and</p> <p>(b) land areas that belong to Her Majesty or in respect of which Her Majesty has the right to dispose and that have been identified and agreed on by Her Majesty and an Indian band for transfer to settle claims based on</p> <p>(i) an outstanding lawful obligation of Her Majesty towards an Indian band pursuant to the specific claims policy of the Government of Canada, or</p> <p>(ii) treaty land entitlement.</p>	<p>(6) Pour l’application du présent article, les terres sur lesquelles les Indiens ont des droits s’entendent :</p> <p>a) des terres visées par des revendications territoriales que le gouvernement fédéral a accepté de négocier dans le cadre de sa politique en matière de revendications territoriales des Indiens et :</p> <p>(i) celles qui ont été, dans le cadre d’un règlement en matière de revendications territoriales, déclarées inaliénables, dans le cas des Territoires du Nord-Ouest ou du Nunavut, sous le régime de la <i>Loi sur les terres territoriales</i> ou, dans le cas du Yukon, en vertu d’une loi de la Législature,</p> <p>(ii) dans le cas des provinces, celles qui ont été choisies par le gouvernement fédéral et celui de la province concernée;</p> <p>b) des terres qui appartiennent à Sa Majesté ou qu’elle a le droit de céder et qui ont été choisies par elle et une bande indienne pour cession en vue d’un règlement des revendications territoriales fondées :</p> <p>(i) sur une obligation légale de Sa Majesté envers une bande indienne aux termes de la politique du gouvernement fédéral en matière de revendications particulières,</p> <p>(ii) sur les droits fonciers découlant d’un traité.</p>	Terres sur lesquelles les Indiens ont des droits
Reference to lands, etc.	<p>(7) For the purposes of this section, a reference to any lands, land areas or reserves includes a reference to all waters on and air above those lands, areas or reserves.</p> <p>1992, c. 37, c. 48; 1993, c. 28, s. 78; 2002, c. 7, s. 123; 2003, c. 9, s. 23.</p>	<p>(7) Pour l’application du présent article, toute mention des terres, territoires ou réserves comprend leurs eaux et leur espace aérien.</p> <p>1992, ch. 37, art. 48; 1993, ch. 28, art. 78; 2002, ch. 7, art. 123; 2003, ch. 9, art. 23.</p>	Règle d’application
Rules governing review panels	<p>49. Sections 29 to 36 and 40 to 42 apply, with such modifications as the circumstances require, in respect of a reference to a mediator or a review panel pursuant to subsection 46(1), 47(1) or 48(1) or (2).</p>	<p>49. Les articles 29 à 36 et 40 à 42 s’appliquent, avec les adaptations nécessaires, aux renvois à une médiation ou à une commission d’examen visés aux paragraphes 46(1), 47(1) ou 48(1) ou (2).</p>	Règles applicables aux commissions
Ministerial orders	<p>50. (1) Where the Minister refers a project to a mediator or a review panel for an assessment of the environmental effects of the project referred to in subsection 46(1), 47(1) or 48(1) or (2), the Minister may, by order, prohibit the proponent of the project from doing any act or thing that would commit the proponent to ensuring that the project is carried out in whole or in part until the assessment is completed and</p>	<p>50. (1) Dans le cas où il effectue le renvoi à un médiateur ou à une commission aux termes des paragraphes 46(1), 47(1) ou 48(1) ou (2), le ministre peut, par arrêté, interdire au promoteur d’accomplir tout acte permettant la mise en oeuvre du projet en tout ou en partie jusqu’à ce que l’examen soit terminé et qu’il soit convaincu que, compte tenu de la mise en oeuvre des mesures d’atténuation indiquées, la réalisation</p>	Suspension du projet

the Minister is satisfied that, taking into account the implementation of any appropriate mitigation measures the project is not likely to cause any significant adverse environmental effects referred to in that subsection or that any such effects are justified in the circumstances.

Idem

(2) Where a project is referred to a mediator or a review panel for an assessment of the environmental effects of the project referred to in subsection 46(1), 47(1) or 48(1) or (2) and the mediator or review panel submits a report to the Minister indicating that the project is likely to cause significant adverse environmental effects referred to in that subsection the Minister may, by order, prohibit the proponent of the project from doing any act or thing that would commit the proponent to ensuring that the project is carried out in whole or in part until the Minister is satisfied that, taking into account the implementation of any appropriate mitigation measures, the project is not likely to cause any significant adverse environmental effects referred to in that subsection or that any such effects are justified in the circumstances.

Consultation
with interested
jurisdictions

(3) The Minister shall, before exercising discretion to make an order under subsection (1) or (2), advise and offer to consult with the governments of all interested provinces and any federal authority, or the band council, party to the agreement or claim or governing body having an interest in the lands where the project is to be carried out, as the case may be.

1992, c. 37, s. 50; 1993, c. 34, s. 35(F).

Injunction

51. (1) Where, on the application of the Attorney General of Canada, it appears to a court of competent jurisdiction that an order made under section 50 in respect of a project has been, is about to be or is likely to be contravened, the court may issue an injunction ordering any person named in the application to refrain from doing any act or thing that would commit the proponent to ensuring that the project or any part thereof is carried out until

(a) with respect to an order made pursuant to subsection 50(1), the assessment of the environmental effects of the project referred to in subsection 46(1), 47(1) or 48(1) or (2) is completed and the Minister is satisfied that, taking into account the implementation of any appropriate mitigation measures, the project is not likely to cause any significant

du projet n'est pas susceptible d'entraîner les effets environnementaux négatifs importants visés à ces articles ou qu'ils sont justifiables dans les circonstances.

Idem

(2) Dans le cas où le médiateur ou la commission en vient à la conclusion dans son rapport au ministre que la mise en oeuvre du projet visé aux paragraphes 46(1), 47(1) ou 48(1) ou (2) est susceptible d'entraîner des effets environnementaux négatifs importants, le ministre peut, par arrêté, interdire au promoteur d'accomplir tout acte permettant la mise en oeuvre du projet en tout ou en partie jusqu'à ce qu'il soit convaincu que, compte tenu de l'application des mesures d'atténuation indiquées, la réalisation du projet n'est pas susceptible d'entraîner les effets environnementaux négatifs importants visés à ces articles ou qu'ils sont justifiables dans les circonstances.

Consultation

(3) Avant de prendre sa décision aux termes des paragraphes (1) ou (2), le ministre avise et offre de consulter, selon le cas, les gouvernements des provinces concernées, toute autorité fédérale ou le conseil de bande, la partie à l'entente ou à la revendication ou l'organisme dirigeant qui a des droits dans les terres où le projet doit être mis en oeuvre.

1992, ch. 37, art. 50; 1993, ch. 34, art. 35(F).

Injunction

51. (1) Si, sur demande présentée par le procureur général du Canada, il conclut à l'observation — réelle ou appréhendée — de l'arrêté pris en application de l'article 50, le tribunal compétent peut, par injonction, interdire à toute personne visée par la demande d'accomplir tout acte permettant la mise en oeuvre du projet en tout ou en partie jusqu'à ce que :

a) dans le cas d'un arrêté pris en vertu du paragraphe 50(1), l'examen par une commission soit terminé et que le ministre soit convaincu que, compte tenu de l'application des mesures d'atténuation indiquées, la réalisation du projet n'est pas susceptible d'entraîner les effets environnementaux négatifs importants visés aux paragraphes 46(1), 47(1) ou 48(1) ou (2) ou qu'ils sont justifiables dans les circonstances;

adverse environmental effects referred to in that subsection or any such effects are justified in the circumstances; and

(b) with respect to an order made pursuant to subsection 50(2), the Minister is satisfied that, taking into account the implementation of any appropriate mitigation measures, the project is not likely to cause any significant adverse environmental effects referred to in that subsection or any such effects are justified in the circumstances.

b) dans le cas d'un arrêté pris en vertu du paragraphe 50(2), le ministre soit convaincu que, compte tenu de l'application des mesures d'atténuation indiquées, la réalisation du projet n'est pas susceptible d'entraîner les effets environnementaux négatifs importants visés à ces articles ou qu'ils sont justifiables dans les circonstances.

Notice

(2) At least forty-eight hours before an injunction is issued under subsection (1), notice of the application shall be given to

- (a) persons named in the application, and
- (b) the governments of all interested provinces and any federal authority, band council, party to the agreement or claim or governing body having an interest in the lands where the project is to be carried out, as the case may be,

unless the urgency of the situation is such that the delay involved in giving such notice would not be in the public interest.

1992, c. 37, s. 51; 1993, c. 34, s. 36(F).

(2) Sauf lorsque cela serait contraire à l'intérêt public en raison de l'urgence de la situation, l'injonction est subordonnée à la signification d'un préavis d'au moins quarante-huit heures :

- a) aux parties nommées dans la demande;
- b) aux gouvernements des provinces concernées et, selon le cas, à l'autorité fédérale, au conseil de bande, à la partie à l'entente ou à la revendication ou à l'organisme dirigeant qui ont des droits dans les terres où le projet doit être mis en oeuvre.

1992, ch. 37, art. 51; 1993, ch. 34, art. 36(F).

Préavis

Order in force

52. (1) An order under section 50 comes into force at the time it is made.

52. (1) L'arrêté pris en application de l'article 50 prend effet dès sa prise.

Prise d'effet de l'arrêté

Approval of Governor in Council

(2) The order ceases to have effect fourteen days after it is made unless, within that period, it is approved by the Governor in Council.

(2) L'arrêté devient inopérant à défaut d'approbation du gouverneur en conseil dans les quatorze jours suivant sa prise.

Approbation du gouverneur en conseil

Exemption from application of Statutory Instruments Act

(3) The order is exempt from the application of sections 3, 5 and 11 of the *Statutory Instruments Act* and shall be published in the *Canada Gazette* within twenty-three days after it is approved by the Governor in Council.

(3) L'arrêté est soustrait à l'application des articles 3, 5 et 11 de la *Loi sur les textes réglementaires* et publié dans la *Gazette du Canada* dans les vingt-trois jours suivant son approbation.

Dérogation à la Loi sur les textes réglementaires

Follow-up program

53. (1) Where the Minister has referred a project to a mediator or a review panel pursuant to subsection 46(1), 47(1) or 48(1) or (2), the Minister shall, in accordance with any regulations made for that purpose, design or approve any follow-up program that the Minister considers appropriate for the project and arrange for the implementation of that program.

53. (1) Dans les cas où il a effectué le renvoi à un médiateur ou à une commission prévu aux paragraphes 46(1), 47(1) ou 48(1) ou (2), le ministre élabore ou approuve, conformément aux règlements pris à cette fin, tout programme de suivi qu'il estime indiqué pour le projet et veille à la mise en oeuvre du programme.

Programme de suivi

Public notice

(2) Following the receipt of the report of the mediator or review panel in respect of the assessment of the environmental effects of the project referred to in subsection 46(1), 47(1) or 48(1) or (2), the Minister shall, in accordance

(2) Sur réception du rapport du médiateur ou de la commission concernant les évaluations environnementales visées aux paragraphes 46(1), 47(1) ou 48(1) ou (2), le ministre porte à

Publicité

with any regulations made for that purpose, advise the public of

- (a) any order or injunction issued under section 50 or 51 in respect of the project;
- (b) any mitigation measures to be implemented with respect to the adverse environmental effects of the project referred to in those subsections;
- (c) the extent to which the recommendations set out in the report have been adopted, and the reasons for not having adopted any of those recommendations;
- (d) any follow-up program that is designed or approved for the project pursuant to subsection (1); and
- (e) any results of any follow-up program.

AGREEMENTS AND ARRANGEMENTS

Provincial
agreement or
arrangement

54. (1) Subject to subsection (3), where a federal authority or the Government of Canada on behalf of a federal authority enters into an agreement or arrangement with the government of a province or any institution of such a government under which a federal authority exercises a power or performs a duty or function referred to in paragraph 5(1)(b) in relation to projects the essential details of which are not specified, the Government of Canada or the federal authority shall ensure that the agreement or arrangement provides for the assessment of the environmental effects of those projects and that the assessment will be carried out as early as practicable in the planning stages of those projects, before irrevocable decisions are made, in accordance with

- (a) this Act and the regulations; or
- (b) a process for the assessment of the environmental effects of projects that is consistent with the requirements of this Act and is in effect in the province where the projects are to be carried out.

International
agreement or
arrangement

(2) Subject to subsection (3), where a federal authority or the Government of Canada on behalf of a federal authority enters into an agreement or arrangement with any government or any person, organization or institution, whether or not part of or affiliated with a government, under which a federal authority exer-

la connaissance du public, conformément aux règlements pris à cette fin :

- a) tout arrêté pris aux termes de l'article 50 ou toute injonction prononcée aux termes de l'article 51;
- b) les mesures d'atténuation éventuelles des effets environnementaux négatifs d'un projet visé à ces paragraphes;
- c) la suite donnée aux recommandations issues du rapport et les motifs du rejet éventuel d'une de celles-ci;
- d) le programme de suivi élaboré ou approuvé aux termes du paragraphe (1);
- e) les résultats du programme de suivi.

ACCORDS SIGNÉS PAR LES AUTORITÉS FÉDÉRALES

Accords avec les
provinces

54. (1) Sous réserve du paragraphe (3), le gouvernement du Canada ou toute autorité fédérale veille à ce que les accords que l'autorité fédérale conclut — ou que le gouvernement conclut en son nom — avec le gouvernement d'une province ou avec l'un de ses organismes, en vertu desquels une autorité fédérale exerce une attribution visée à l'alinéa 5(1)b) au titre de projets dont les éléments essentiels ne sont pas déterminés, prévoient l'évaluation des effets environnementaux des projets, cette évaluation devant être effectuée le plus tôt possible au stade de leur planification, avant la prise d'une décision irrévocable conformément à la présente loi et aux règlements ou au processus, compatible avec la présente loi, d'évaluation des effets environnementaux de projets applicable dans la province où ceux-ci doivent être mis en oeuvre.

Accords
internationaux

(2) Sous réserve du paragraphe (3), le gouvernement du Canada ou toute autorité fédérale veille à ce que les accords que l'autorité fédérale conclut — ou que le gouvernement conclut en son nom — avec soit un gouvernement, soit une personne, un organisme ou une institution, peu importe qu'ils soient ou non affiliés à un

cises a power or performs a duty or function referred to in paragraph 5(1)(b) or 10.1(2)(b) in relation to projects the essential details of which are not specified and that are to be carried out both outside Canada and outside federal lands, the Government of Canada or the federal authority shall ensure, in so far as is practicable and subject to any other such agreement to which the Government of Canada or federal authority is a party, that the agreement or arrangement provides for the assessment of the environmental effects of those projects and that the assessment will be carried out as early as practicable in the planning stages of those projects, before irrevocable decisions are made, in accordance with

- (a) this Act and the regulations; or
- (b) a process for the assessment of the environmental effects of projects that is consistent with the requirements of this Act and is in effect in the foreign state where the projects are to be carried out.

Exception

(3) For greater certainty, if a federal authority will be required to exercise a power or perform a duty or function referred to in paragraph 5(1)(b) or 10.1(2)(b) — in relation to a project in respect of which an agreement or arrangement referred to in subsection (1) or (2) applies — after the essential details of the project are specified

- (a) subsection (1) or (2), as the case may be, does not apply in respect of the agreement or arrangement; and
- (b) section 5 or 10.1, as the case may be, applies.

1992, c. 37, s. 54; 1993, c. 34, s. 37(F); 2003, c. 9, s. 24.

CANADIAN ENVIRONMENTAL ASSESSMENT REGISTRY

ESTABLISHMENT OF REGISTRY

Canadian
Environmental
Assessment
Registry

55. (1) For the purpose of facilitating public access to records relating to environmental assessments and providing notice in a timely manner of the assessments, there shall be a registry called the Canadian Environmental Assessment Registry, consisting of an Internet site and project files.

Right of access

(2) The Registry shall be operated in a manner to ensure convenient public access to it.

gouvernement ou en fassent partie, en vertu desquels une autorité fédérale exerce une attribution visée aux alinéas 5(1)b) ou 10.1(2)b) au titre de projets dont les éléments essentiels ne sont pas déterminés qui doivent être mis en œuvre à la fois à l'étranger et hors du territoire domanial, prévoient, dans la mesure du possible, tout en étant compatibles avec les accords dont le Canada ou une autorité fédérale est déjà signataire à leur entrée en vigueur, l'évaluation des effets environnementaux des projets, cette évaluation devant être effectuée le plus tôt possible au stade de leur planification, avant la prise d'une décision irrévocable, conformément à la présente loi et aux règlements ou au processus, compatible avec la présente loi, d'évaluation des effets environnementaux de projets applicable dans l'État étranger où ceux-ci doivent être mis en œuvre.

(3) Il est entendu que, dans les cas où une autorité fédérale est tenue d'exercer une attribution visée aux alinéas 5(1)b) ou 10.1(2)b) relativement aux projets qui font l'objet d'un accord visé aux paragraphes (1) ou (2) après la détermination des éléments essentiels de ces projets, ces paragraphes ne s'appliquent pas à l'accord et les articles 5 ou 10.1 s'appliquent.

1992, ch. 37, art. 54; 1993, ch. 34, art. 37(F); 2003, ch. 9, art. 24.

REGISTRE CANADIEN D'ÉVALUATION ENVIRONNEMENTALE

ÉTABLISSEMENT DU REGISTRE

Exception

Registre
canadien
d'évaluation
environnementale

55. (1) Afin de faciliter l'accès du public aux documents relatifs aux évaluations environnementales et de notifier celles-ci en temps opportun, est établi le registre canadien d'évaluation environnementale formé, d'une part, d'un site Internet et, d'autre part, des dossiers de projet.

Droit d'accès

(2) Le registre est maintenu de façon à en assurer l'accès facile au public. Ce droit d'accès

This right of access to the Registry is in addition to any right of access provided under any other Act of Parliament.

cès existe indépendamment de tout droit d'accès prévu par toute autre loi fédérale.

Copy

(3) For the purpose of facilitating public access to records included in the Registry, in the case of a screening or comprehensive study, the federal environmental assessment coordinator and, in any other case, the Agency shall ensure that a copy of any such record is provided in a timely manner on request.

1992, c. 37, s. 55; 1993, c. 34, s. 38(F); 2003, c. 9, s. 25.

(3) Afin de faciliter l'accès du public aux documents versés au registre, le coordonnateur fédéral de l'évaluation environnementale, dans le cas d'un examen préalable et d'une étude approfondie, et l'Agence, dans les autres cas, veillent à ce que soit fourni, sur demande et en temps opportun, une copie de tout tel document.

1992, ch. 37, art. 55; 1993, ch. 34, art. 38(F); 2003, ch. 9, art. 25.

Copie

INTERNET SITE

SITE INTERNET

Establishment and maintenance

55.1 (1) The Agency shall, in accordance with this Act and the regulations, establish and maintain an Internet site to be generally accessible through what is commonly referred to as the Internet.

55.1 (1) L'Agence établit et tient, conformément à la présente loi et aux règlements, un site généralement accessible sur le réseau communément appelé Internet.

Établissement et tenue du site Internet

Contents

(2) Subject to subsection 55.5(1), the Internet site shall include

(2) Sont versés au site Internet, sous réserve du paragraphe 55.5(1) :

Contenu

(a) within 14 days after the commencement of an environmental assessment, notice of its commencement, except where a class screening report is used under subsection 19(5) or (6);

a) dans les quatorze jours suivant le début de l'évaluation environnementale, avis du début de l'évaluation, sauf si l'autorité responsable utilise un rapport d'examen préalable type en vertu des paragraphes 19(5) ou (6);

(b) an agreement contemplated by subsection 12.4(3);

b) l'entente visée au paragraphe 12.4(3);

(c) a description of the scope of the project in relation to which an environmental assessment is to be conducted, as determined under section 15;

c) la description de la portée, déterminée au titre de l'article 15, du projet à l'égard duquel l'évaluation environnementale doit être effectuée;

(d) a statement of the projects in respect of which a class screening report is used under subsection 19(5) or (6);

d) le relevé des projets à l'égard desquels une autorité responsable utilise un rapport d'examen préalable type en vertu des paragraphes 19(5) ou (6);

(e) any declaration referred to in subsection 19(4) and the report to which it relates or a description of how a copy of the report may be obtained, and any declaration referred to in subsection 19(9);

e) toute désignation faite dans le cadre du paragraphe 19(4), avec le rapport ou une indication de la façon d'en obtenir copie, de même que toute déclaration faite dans le cadre du paragraphe 19(9);

(f) notice of termination of an environmental assessment by a responsible authority under section 26;

f) avis de la décision de l'autorité responsable de mettre fin à l'évaluation environnementale au titre de l'article 26;

(g) notice of termination of an environmental assessment by the Minister under section 27;

g) avis de la décision du ministre de mettre fin à l'évaluation environnementale au titre de l'article 27;

- (h) any public notices that are issued by responsible authorities or the Agency to request public input into an environmental assessment;
- (i) notice of a decision of the Minister to refer a project under paragraph 21.1(1)(a);
- (j) where the responsible authority, in accordance with subsection 18(3), gives the public an opportunity to participate in the screening of a project or where the Minister, under paragraph 21.1(1)(a), refers a project to the responsible authority to continue a comprehensive study, a description of the factors to be taken into consideration in the environmental assessment and of the scope of those factors or an indication of how such a description may be obtained;
- (k) the screening or comprehensive study report taken into consideration by a responsible authority for the purpose of a decision under section 20 or 37 or a description of how a copy of the report may be obtained, except where a class screening report is used under subsection 19(5) or (6);
- (l) an environmental assessment decision statement under subsection 23(1) and any request made under subsection 23(2);
- (m) notice of the referral of a project to a mediator or review panel;
- (n) the terms of reference of a mediation or a review panel;
- (o) if the Minister has ordered the conclusion of a mediation under subsection 29(4), notice of the order;
- (p) a report of a mediator or review panel or a summary of the report;
- (q) a response under paragraph 37(1.1)(a) to the report of a mediator or review panel;
- (r) except where a class screening report is used under subsection 19(5) or (6), the decision of a responsible authority, made under section 20 or 37 concerning the environmental effects of the project, and a statement of any mitigation measures the implementation of which the responsible authority took into account in making its decision;
- h) avis public lancé par l'autorité responsable ou l'Agence sollicitant la participation du public à l'évaluation environnementale;
- i) avis de la décision du ministre de renvoyer le projet au titre de l'alinéa 21.1(1)a);
- j) dans le cas où l'autorité responsable donne, au titre du paragraphe 18(3), la possibilité au public de participer à l'examen préalable ou dans le cas où le ministre renvoie, au titre de l'alinéa 21.1(1)a), le projet à l'autorité responsable pour qu'elle poursuive l'étude approfondie, une description des éléments à prendre en compte dans le cadre de l'évaluation environnementale et de la portée de ceux-ci ou une indication de la façon d'obtenir copie de cette description;
- k) le rapport d'examen préalable ou de l'étude approfondie sur lequel se fonde la décision de l'autorité responsable au titre des articles 20 ou 37 — ou une indication de la façon d'en obtenir copie —, sauf si l'autorité responsable utilise un rapport d'examen préalable type en vertu des paragraphes 19(5) ou (6);
- l) la déclaration que fait le ministre en application du paragraphe 23(1) et toute demande faite au titre du paragraphe 23(2);
- m) avis de renvoi du projet à la médiation ou à l'examen par une commission;
- n) le mandat du médiateur ou de la commission;
- o) avis, le cas échéant, de la décision du ministre de mettre fin à la médiation au titre du paragraphe 29(4);
- p) le rapport du médiateur ou de la commission, ou un résumé du rapport;
- q) la suite à donner, au titre du paragraphe 37(1.1), au rapport du médiateur ou de la commission;
- r) sauf si l'autorité responsable utilise un rapport d'examen préalable type en vertu des paragraphes 19(5) ou (6), la décision prise par celle-ci en application des articles 20 ou 37 relativement aux effets environnementaux du projet et la mention des mesures d'atténuation dont elle a tenu compte dans le cadre de sa décision;

- (s) a notice stating whether or not, pursuant to subsection 38(1), a follow-up program for the project is considered appropriate;
- (t) a description summarizing any follow-up program and its results or an indication of how a full description of the program and its results may be obtained;
- (u) any other information that the responsible authority or the Agency, as the case may be, considers appropriate, including information in the form of a list of relevant documents in which case a description of how they may be obtained shall be provided; and
- (v) any other record or information prescribed under paragraph 59(h.1).

Form and manner of Internet site

(3) The Agency shall determine and notify the public

- (a) what the form of the Internet site is to be and how it is to be kept;
- (b) how records and information are to be included in it;
- (c) what information must be contained in any record referred to in subsection (2);
- (d) what records and information are to be included in the Internet site, in addition to any record referred to in subsection (2);
- (e) when information must be included in the Internet site;
- (f) when information may be removed from the Internet site; and
- (g) how access to the Internet site is to be provided.

2003, c. 9, s. 25.

Duty to contribute records — Agency

In the case of mediation or review panel

55.2 (1) The Agency shall ensure that the records referred to in paragraphs 55.1(2)(b), (e), (i) and (l) are included in the Internet site.

(2) The Agency shall, in the case of a mediation or an assessment by a review panel, ensure that the records referred to in paragraphs 55.1(2)(c), (g), (h), (m), (n), (o), (p), (q) and (u) and any record or information referred to in paragraph 55.1(2)(v) are included in the Internet site.

2003, c. 9, s. 25.

s) avis indiquant si, au terme de l'examen visé au paragraphe 38(1), le programme de suivi est jugé opportun;

t) la description sommaire du programme de suivi et de ses résultats ou une indication de la façon d'obtenir copie de la description complète du programme et de ses résultats;

u) tout autre renseignement, notamment sous la forme d'une liste de documents — accompagnée, dans ce cas, d'une indication de la façon d'obtenir copie de ceux-ci —, que l'autorité responsable ou l'Agence, selon le cas, juge indiqué;

v) tout autre document ou renseignement prévu par règlement pris en vertu de l'alinéa 59h.1).

(3) L'Agence décide et avise le public :

- a) des modalités de forme et de tenue du site Internet;
- b) des modalités selon lesquelles les documents et renseignements doivent y être versés;
- c) des renseignements qui doivent se trouver dans les documents visés au paragraphe (2);
- d) des documents et renseignements à verser au site Internet en plus des documents visés au paragraphe (2);
- e) du moment où les renseignements doivent être versés au site Internet;
- f) du moment où les documents peuvent être retirés du site Internet;
- g) des modalités d'accès au site Internet.

2003, ch. 9, art. 25.

Modalités de forme et de contenu

55.2 (1) L'Agence veille à ce que soient versés au site Internet les documents visés aux alinéas 55.1(2)b), e), i) et l).

(2) Elle veille également à ce que, dans le cas d'une médiation ou d'un examen par une commission, les documents visés aux alinéas 55.1(2)c), g), h), m), n), o), p), q) et u) y soient versés, de même que, le cas échéant, les documents et renseignements visés à l'alinéa 55.1(2)v).

2003, ch. 9, art. 25.

Responsabilité à l'égard du site Internet : Agence

Cas de médiation et d'examen par une commission

Duty to contribute records — responsible authorities	55.3 (1) A responsible authority shall ensure that the records referred to in paragraphs 55.1(2)(a), (f), (j), (k), (r), (s) and (t) and, in the case of a screening or a comprehensive study, the records referred to in paragraphs 55.1(2)(c), (h) and (u) and any record or information referred to in paragraph 55.1(2)(v), are included in the Internet site.	55.3 (1) L'autorité responsable veille à ce que soient versés au site Internet les documents visés aux alinéas 55.1(2)a), f), j), k), r), s) et t). Elle veille également à ce que, dans le cas d'un examen préalable ou d'une étude approfondie, les documents visés aux alinéas 55.1(2)c), h) et u) y soient versés, de même que les documents et renseignements visés à l'alinéa 55.1(2)v).	Responsabilité à l'égard du site Internet : autorité responsable
Statement — paragraph 55.1(2)(d)	(2) A responsible authority shall ensure that the statement referred to in paragraph 55.1(2)(d) is included in the Internet site every three months or with any other greater frequency to which it agrees with the Agency.	(2) Elle veille également à ce que les relevés visés à l'alinéa 55.1(2)d) y soient versés trimestriellement ou selon la fréquence plus élevée dont elle convient avec l'Agence.	Relevés : al. 55.1(2)d)
Time for inclusion of report	(3) A screening report referred to in paragraph 55.1(2)(k) or a description of how a copy of it may be obtained shall be included in the Internet site not later than the decision referred to in paragraph 55.1(2)(r) that is based on the report, unless otherwise authorized by the Agency. 2003, c. 9, s. 25.	(3) Sauf autorisation contraire de l'Agence, le rapport d'examen préalable ou de l'étude approfondie visé à l'alinéa 55.1(2)k) — ou une indication de la façon d'en obtenir copie — doit être versé au site Internet avant la décision connexe visée à l'alinéa 55.1(2)r) ou en même temps qu'elle. 2003, ch. 9, art. 25.	Règle relative au versement de certains documents

PROJECT FILES

DOSSIERS DE PROJET

Establishment and maintenance	55.4 (1) In respect of every project for which an environmental assessment is conducted, a project file shall be established and maintained, in accordance with this Act and the regulations, (a) by the responsible authority from the commencement of the environmental assessment until any follow-up program in respect of the project is completed; and (b) where the project is referred to a mediator or a review panel, by the Agency from the appointment of the mediator or the members of the review panel until the report of the mediator or review panel is submitted to the Minister.	55.4 (1) Les dossiers de projet sont établis et tenus conformément à la présente loi et aux règlements à l'égard de chacun des projets pour lesquels une évaluation environnementale est effectuée : a) par l'autorité responsable dès le début de l'évaluation environnementale et jusqu'à ce que le programme de suivi soit terminé; b) par l'Agence, dans les cas où une médiation ou un examen par une commission est effectué, dès la nomination du médiateur ou des membres de la commission et jusqu'au moment de la remise du rapport au ministre.	Établissement et tenue des dossiers de projet
Contents of project file	(2) Subject to subsection 55.5(1), a project file shall contain all records produced, collected or submitted with respect to the environmental assessment of the project, including (a) all records included in the Internet site; (b) any report relating to the assessment; (c) any comments filed by the public in relation to the assessment;	(2) Sous réserve du paragraphe 55.5(1), chaque dossier de projet contient tous les documents produits, recueillis ou reçus relativement à l'évaluation environnementale du projet, notamment : a) les documents versés au site Internet; b) tout rapport relatif à l'évaluation environnementale; c) toute observation du public à l'égard de l'évaluation;	Contenu des dossiers de projet

- (d) any records relating to the need for, design of or implementation of any follow-up program; and
- (e) any documents requiring mitigation measures to be implemented.

2003, c. 9, s. 25.

- d) tous les documents préparés pour l'examen de l'opportunité d'un programme de suivi et pour l'élaboration et l'application d'un tel programme;
- e) tous les documents exigeant l'application de mesures d'atténuation.

2003, ch. 9, art. 25.

GENERAL

Categories of information that may be made publicly available

55.5 (1) The Registry shall contain a record, part of a record or information only if

- (a) it has otherwise been made publicly available; or
- (b) the responsible authority, in the case of a record under its control, or the Minister, in the case of a record under the Agency's control,

- (i) determines that it would have been disclosed to the public in accordance with the *Access to Information Act* if a request had been made in respect of that record under that Act at the time the record came under the control of the responsible authority or the Agency, including any record that would be disclosed in the public interest pursuant to subsection 20(6) of that Act, or

- (ii) believes on reasonable grounds that it would be in the public interest to disclose it because it is required for the public to participate effectively in the environmental assessment — other than any record the disclosure of which would be prohibited under section 20 of the *Access to Information Act*.

Applicability of sections 27, 28 and 44 of *Access to Information Act* to third party information

(2) Sections 27, 28 and 44 of the *Access to Information Act* apply to any information described in subsection 27(1) of that Act that the Agency or a responsible authority intends be included in the Registry with any modifications that the circumstances require, including the following:

- (a) the information is deemed to be a record that the head of a government institution intends to disclose; and
- (b) any reference to the person who requested access shall be disregarded.

DISPOSITIONS GÉNÉRALES

Genre d'information disponible

55.5 (1) Le registre ne comporte que les documents, parties de document ou renseignements :

- a) qui ont par ailleurs été rendus publics;
- b) dont, de l'avis de l'autorité responsable, dans le cas de documents qu'elle contrôle, ou de l'avis du ministre, dans le cas de documents que l'Agence contrôle :

- (i) soit la communication serait faite conformément à la *Loi sur l'accès à l'information* si une demande en ce sens était faite aux termes de celle-ci au moment où l'autorité responsable ou l'Agence prend le contrôle des documents, y compris les documents qui seraient communiqués dans l'intérêt public aux termes du paragraphe 20(6) de cette loi,

- (ii) soit il existe des motifs raisonnables de croire qu'il serait d'intérêt public de les communiquer parce qu'ils sont nécessaires à une participation efficace du public à l'évaluation environnementale, à l'exception des documents contenant des renseignements dont la communication doit être refusée en vertu de l'article 20 de la *Loi sur l'accès à l'information*.

(2) Sous réserve des adaptations nécessaires, notamment de celles qui suivent, les articles 27, 28 et 44 de la *Loi sur l'accès à l'information* s'appliquent à tout renseignement visé au paragraphe 27(1) de cette loi que l'Agence ou l'autorité responsable a l'intention de faire verser au registre :

- a) ce renseignement est réputé constituer un document que le responsable d'une institution fédérale a l'intention de communiquer;
- b) il ne doit pas être tenu compte des mentions de la personne qui fait la demande de communication des renseignements.

Application des art. 27, 28 et 44 de la *Loi sur l'accès à l'information*

Deemed application	<p>(3) This section applies with respect to a responsible authority that is a parent Crown corporation but is not a government institution within the meaning of the <i>Access to Information Act</i> as if it were such a government institution.</p> <p>2003, c. 9, s. 25.</p>	<p>(3) Le présent article s'applique aux autorités responsables qui sont des sociétés d'État mères mais non des institutions fédérales au sens de la <i>Loi sur l'accès à l'information</i> comme si elles étaient de telles institutions.</p> <p>2003, ch. 9, art. 25.</p>	Précision
Protection from civil proceeding or prosecution	<p>55.6 Notwithstanding any other Act of Parliament, no civil or criminal proceedings lie against a responsible authority, the Agency or the Minister, or against any person acting on behalf of them or under their direction, or against a director or officer of a Crown corporation to which this Act applies and no proceedings lie against the Crown, the Agency or any responsible authority, for the disclosure in good faith of any record or any part of a record pursuant to this Act or for any consequences that flow from that disclosure or for the failure to give any notice required under section 27 or 28 of the <i>Access to Information Act</i> if reasonable care is taken to give the required notice.</p> <p>2003, c. 9, s. 25.</p>	<p>55.6 Malgré toute autre loi fédérale, l'autorité responsable, l'Agence ou le ministre et les personnes qui agissent en leur nom ou sous leur autorité, ainsi que les administrateurs et les dirigeants des sociétés d'État auxquelles la présente loi s'applique, bénéficient de l'immunité en matière civile ou pénale, et la Couronne, l'Agence ainsi que les autorités responsables bénéficient de l'immunité devant toute juridiction, pour la communication totale ou partielle d'un document faite de bonne foi en vertu de la présente loi ainsi que pour les conséquences qui en découlent; ils bénéficient également de l'immunité dans les cas où, ayant fait preuve de la diligence nécessaire, ils n'ont pu donner les avis prévus aux articles 27 et 28 de la <i>Loi sur l'accès à l'information</i>.</p> <p>2003, ch. 9, art. 25.</p>	Immunité
<div>RELEVANT INFORMATION</div> <div>INFORMATION PERTINENTE</div>			
Preparation of statistical summary	<p>56. (1) During each fiscal year a responsible authority shall maintain a statistical summary of all of the environmental assessments undertaken or directed by it and all courses of action taken, and all decisions made, in relation to the environmental effects of the projects after the assessments were completed.</p>	<p>56. (1) L'autorité responsable prépare pour chaque exercice un résumé statistique de toutes les évaluations environnementales effectuées par elle ou sous son autorité ainsi que de toutes les décisions prises à l'égard des effets environnementaux causés par les projets une fois terminées les évaluations.</p>	Résumés statistiques
Idem	<p>(2) The responsible authority shall ensure that the summary for a fiscal year is completed within one month after the end of that fiscal year.</p>	<p>(2) L'autorité responsable veille à ce que le résumé applicable à un exercice soit prêt au plus tard un mois après la fin de l'exercice.</p>	Idem
Information required in support of quality assurance program	<p>56.1 Federal authorities and persons and bodies referred to in sections 8 to 10 shall, if requested to do so by the Agency, provide the Agency with any information respecting the assessments whose conduct they ensure under this Act that the Agency considers necessary in support of a quality assurance program that it establishes.</p> <p>2003, c. 9, s. 27.</p>	<p>56.1 Les autorités fédérales et les personnes ou organismes visés à l'un ou l'autre des articles 8 à 10 fournissent à l'Agence, sur demande, les renseignements concernant toute évaluation dont ils veillent à la réalisation sous le régime de la présente loi que l'Agence estime utiles à l'appui d'un programme d'assurance de la qualité mis sur pied à son initiative.</p> <p>2003, ch. 9, art. 27.</p>	Renseignements nécessaires pour le programme d'assurance de la qualité

JUDICIAL REVIEW

Defect in form
or technical
irregularity

57. An application for judicial review in connection with any matter under this Act shall be refused where the sole ground for relief established on the application is a defect in form or a technical irregularity.

ADMINISTRATION

MINISTER'S POWERS

Powers to
facilitate
environmental
assessments

58. (1) For the purposes of this Act, the Minister may

- (a) issue guidelines and codes of practice respecting the application of this Act and the regulations and, without limiting the generality of the foregoing, establish criteria to determine whether a project, taking into account the implementation of any appropriate mitigation measures, is likely to cause significant adverse environmental effects or whether such effects are justified in the circumstances;
- (b) establish research and advisory bodies;
- (c) enter into agreements or arrangements with any jurisdiction within the meaning of paragraph 40(1)(a), (b), (c) or (d) respecting assessments of environmental effects;
- (d) enter into agreements or arrangements with any jurisdiction, within the meaning of subsection 40(1), for the purposes of coordination, consultation, exchange of information and the determination of factors to be considered in relation to the assessment of the environmental effects of projects of common interest;
- (e) recommend the appointment of members to bodies established by federal authorities or to bodies referred to in paragraph 40(1)(d), on a temporary basis, for the purpose of facilitating a substitution pursuant to section 43;
- (f) establish criteria for the appointment of mediators and members of review panels;
- (g) establish criteria for the approval of a substitution pursuant to section 43;
- (h) establish criteria for the purposes of an alternative manner of conducting an assessment of the environmental effects of a

CONTRÔLE JUDICIAIRE

Vice de forme

57. Il n'est admise aucune demande de contrôle judiciaire liée à la présente loi et fondée uniquement sur un vice de forme ou une irrégularité technique.

ADMINISTRATION

POUVOIRS DU MINISTRE

Évaluation
environnementale

58. (1) Pour l'application de la présente loi, le ministre peut :

- a) donner des lignes directrices et établir des codes de pratique ou de procédure d'application de la présente loi et des règlements, y compris, établir des critères servant à déterminer si, compte tenu de l'application de mesures d'atténuation indiquées, est susceptible d'entraîner des effets environnementaux négatifs importants ou si ces effets sont justifiables dans les circonstances;
- b) constituer des organismes consultatifs et de recherche;
- c) conclure des accords avec toute instance au sens des alinéas 40(1)a), b), c) ou d) en matière d'évaluation des effets environnementaux;
- d) conclure des accords avec toute instance, au sens du paragraphe 40(1), en matière de coordination, de consultation, d'échange d'information et de détermination des facteurs à considérer relativement à l'évaluation des effets environnementaux de projets d'intérêt commun;
- e) recommander la nomination de membres temporaires auprès des organismes constitués par des autorités fédérales ou auprès des organismes visés à l'alinéa 40(1) d) en vue de faciliter la substitution visée à l'article 43;
- f) fixer les critères de nomination des médiateurs et des membres des commissions d'évaluation environnementale;
- g) fixer les critères applicables aux substitutions effectuées en vertu de l'article 43;
- h) fixer les critères des modalités de rechange de l'évaluation environnementale des effets environnementaux visée au paragraphe 46(2) ou 47(2);

project referred to in subsection 46(2) or 47(2); and

(i) make regulations prescribing any project or class of projects for which a comprehensive study is required where the Minister is satisfied that the project or any project within that class is likely to have significant adverse environmental effects.

Participant funding

(1.1) For the purposes of this Act, the Minister shall establish a participant funding program to facilitate the participation of the public in comprehensive studies, mediations and assessments by review panels established under either subsection 33(1) or 40(2).

Power to enter into international agreements

(2) The Minister and the Minister of Foreign Affairs may enter into agreements or arrangements with any jurisdiction within the meaning of paragraph 40(1)(e) or (f) respecting assessments of environmental effects, including, without limiting the generality of the foregoing, for the purposes of implementing the provisions of any international agreement or arrangement to which the Government of Canada is a party respecting the assessment of environmental effects referred to in subsection 47(1).

Opportunity for public to comment

(3) The Minister shall provide reasonable public notice of and a reasonable opportunity for anyone to comment on draft guidelines, codes of practice, agreements, arrangements, criteria or orders under this section.

Availability to public

(4) Any guidelines, codes of practice, agreements, arrangements, criteria or orders shall be made available to the public.

1992, c. 37, s. 58; 1993, c. 34, s. 39(F); 1994, c. 46, s. 4; 1995, c. 5, s. 25; 2003, c. 9, s. 28.

i) prendre des règlements désignant des projets ou des catégories de projets pour lesquels une étude approfondie est obligatoire, s'il est convaincu que ceux-ci sont susceptibles d'entraîner des effets environnementaux négatifs importants.

(1.1) Le ministre crée, pour l'application de la présente loi, un programme d'aide financière pour faciliter la participation du public aux études approfondies, aux médiations et aux examens par une commission constituée dans le cadre des paragraphes 33(1) ou 40(2).

Fonds de participation

(2) Le ministre et le ministre des Affaires étrangères peuvent conclure des accords avec toute instance au sens des alinéas 40(1)e) ou f) en matière d'évaluation des effets environnementaux, notamment pour la mise en oeuvre de tout accord international, auquel le gouvernement du Canada est partie, concernant l'examen des effets environnementaux visé au paragraphe 47(1).

Accords internationaux

(3) Le ministre donne un préavis public raisonnable des projets de lignes directrices, de codes de pratique, d'accords, de critères ou d'arrêtés établis en application du présent article, ainsi que la possibilité, pour quiconque, de faire des observations à leur sujet.

Préavis

(4) Les lignes directrices, codes de pratique, accords, critères et arrêtés sont accessibles au public.

Accessibilité

1992, ch. 37, art. 58; 1993, ch. 34, art. 39(F); 1994, ch. 46, art. 4; 1995, ch. 5, art. 25; 2003, ch. 9, art. 28.

REGULATIONS

Regulations

59. The Governor in Council may make regulations

(a) respecting the procedures and requirements of, and the time periods relating to, environmental assessment and follow-up programs, including the conduct of assessments by review panels established pursuant to section 40 and the timing of taking a course of action pursuant to section 20 or 37 where two or more federal authorities are likely to exercise a power or perform a duty

RÈGLEMENTS

59. Le gouverneur en conseil peut, par règlement :

a) régir les procédures, les délais applicables et les exigences relatives à l'évaluation environnementale et au programme de suivi, notamment le moment de la prise de mesures au titre des articles 20 ou 37 quand plusieurs autorités fédérales sont susceptibles d'exercer les attributions visées à l'article 5, ainsi que les évaluations effectuées par une commission aux termes de l'article 40;

Règlements

or function referred to in section 5 with respect to the same project;

(a.1) respecting the duties and functions of the federal environmental assessment coordinator, and respecting the selection or designation of the coordinator;

(b) prescribing, for the purpose of the definition “project” in subsection 2(1), any physical activity or class of physical activities;

(c) exempting any projects or classes of projects from the requirement to conduct an assessment under this Act that

(i) in the opinion of the Governor in Council, ought not to be assessed for reasons of national security,

(ii) in the case of projects in relation to physical works, in the opinion of the Governor in Council, have insignificant environmental effects, or

(iii) have a total cost below a prescribed amount and meet prescribed environmental conditions;

(c.1) exempting, in replacement of exemptions made under paragraph (c), in relation to any Crown corporation to which this Act applies or in relation to the Canadian International Development Agency, any projects or classes of projects to be carried out outside Canada and any federal lands from the requirement to conduct an environmental assessment under this Act that

(i) in the opinion of the Governor in Council, ought not to be assessed for reasons of national security,

(ii) in the case of projects in relation to a physical work, in the opinion of the Governor in Council, have insignificant environmental effects, or

(iii) have a total cost below a prescribed amount and meet prescribed environmental conditions;

(d) [Repealed, 2003, c. 9, s. 29]

(e) prescribing any body, other than the government of a province, to be a federal authority for the purposes of this Act;

(f) prescribing, for the purposes of paragraph 5(1)(d), the provisions of any Act of

a.1) régir les attributions du coordonnateur fédéral de l'évaluation environnementale et la façon dont il est désigné;

b) désigner une activité concrète ou une catégorie d'activités concrètes pour l'application de la définition de « projet » au paragraphe 2(1);

c) soustraire à l'évaluation exigée par la présente loi des projets ou des catégories de projets :

(i) dont, à son avis, l'évaluation ne serait pas indiquée pour des raisons de sécurité nationale,

(ii) qui sont liés à un ouvrage et dont, à son avis, les effets environnementaux ne sont pas importants,

(iii) qui remplissent les conditions de nature environnementale prévues par règlement et dont le coût total est en-deçà du seuil réglementaire;

c.1) en remplacement des projets ou catégories de projets visés à l'alinéa c) et à l'égard des sociétés d'État auxquelles la présente loi s'applique ou de l'Agence canadienne de développement international, soustraire à l'évaluation environnementale prévue à la présente loi des projets ou catégories de projets devant être réalisés à l'extérieur du Canada et du territoire domanial :

(i) dont, à son avis, l'évaluation ne serait pas indiquée pour des raisons de sécurité nationale,

(ii) qui sont liés à un ouvrage et dont, à son avis, les effets environnementaux ne sont pas importants,

(iii) qui remplissent les conditions de nature environnementale que prévoit le règlement et dont le coût total est en-deçà du seuil réglementaire;

d) [Abrogé, 2003, ch. 9, art. 29]

e) déterminer quels organismes, autres que le gouvernement d'une province, sont des autorités fédérales pour l'application de la présente loi;

f) déterminer, pour l'application de l'alinéa 5(1)d), des dispositions de toute loi fédérale ou de textes pris sous son régime;

Parliament or any instrument made under an Act of Parliament;

(g) prescribing the provisions of any Act of Parliament or any regulation made pursuant to any such Act that confer powers, duties or functions on the Governor in Council, the exercise or performance of which require an environmental assessment under subsection 5(2);

(h) respecting the dissemination by responsible authorities of information relating to projects and the environmental assessment of projects and the establishment, maintenance and operation of project files referred to in section 55.4, including facilities to enable the public to examine physical or electronic records contained in the files, the time and manner in which those records may be examined or copied by the public and the transfer and retention of those records after the completion of any follow-up program;

(h.1) prescribing records or information to be included in the Internet site by the Agency or a responsible authority;

(h.2) respecting the charging of fees for providing copies of documents contained in the Registry;

(h.3) for the purposes of subsection 38(1) or (2) or 53(1), prescribing the manner of designing a follow-up program;

(i) varying or excluding, in the prescribed circumstances, any procedure or requirement of the environmental assessment process set out in this Act or the regulations for the purpose of adapting the process in respect of

(i) projects to be carried out on reserves, surrendered lands or other lands that are vested in Her Majesty and subject to the *Indian Act*,

(ii) projects to be carried out outside Canada and either outside of federal lands or on federal lands described in paragraph (a) of the definition “federal lands” in subsection 2(1),

(iii) projects to be carried out under international agreements or arrangements entered into by the Government of Canada or a federal authority,

g) désigner les dispositions législatives ou réglementaires fédérales conférant des attributions au gouverneur en conseil pour l'exercice desquelles le paragraphe 5(2) exige une évaluation environnementale;

h) régir la communication par les autorités responsables de l'information relative aux projets et à l'évaluation environnementale de ceux-ci, et l'établissement et la tenue des dossiers de projet visés à l'article 55.4, y compris les installations nécessaires pour permettre au public de consulter ces dossiers — que ceux-ci soient constitués de documents physiques ou informatiques —, les heures et les modalités de consultation et de reproduction des dossiers, ainsi que le transfert et la garde des documents une fois terminé le programme de suivi;

h.1) désigner les documents et renseignements devant être versés dans le site Internet par l'Agence ou l'autorité responsable;

h.2) régir le prix à payer pour obtenir copie de tout document versé au registre;

h.3) pour l'application des paragraphes 38(1) ou (2) ou 53(1), prévoir les modalités applicables à l'élaboration de programmes de suivi;

i) modifier ou exclure, dans les circonstances prévues par règlement, toute procédure ou exigence du processus d'évaluation environnementale établi en vertu de la présente loi et des règlements afin d'adapter le processus aux :

(i) projets à réaliser dans les réserves, terres cédées ou autres terres dévolues à Sa Majesté et assujetties à la *Loi sur les Indiens*,

(ii) projets à réaliser à l'extérieur du Canada, soit à l'extérieur du territoire domanial, soit sur la partie du territoire domanial visée à l'alinéa a) de la définition de ce terme au paragraphe 2(1),

(iii) projets à entreprendre en vertu d'accords internationaux conclus par le gouvernement du Canada ou une autorité fédérale,

(iv) projets à réaliser au Canada ou sur le territoire domanial pour lesquels une auto-

(iv) projects to be carried out within Canada or on federal lands in respect of which a federal authority exercises a power or performs a duty or function referred to in paragraph 5(1)(b) or (c),

(v) projects in respect of which the Canada-Nova Scotia Offshore Petroleum Board established pursuant to the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act*, the Canada-Newfoundland Offshore Petroleum Board established pursuant to the *Canada-Newfoundland Atlantic Accord Implementation Act* or other similar boards exercise a power or perform a duty or function referred to in section 5, or

(vi) projects in relation to which there are matters of national security;

(i.1) prescribing, in the case of projects that are to be carried out outside Canada and any federal lands and that are subject to an environmental assessment whose conduct a Crown corporation to which this Act applies must ensure, in prescribed circumstances or on any prescribed terms and conditions,

(i) federal authorities that, notwithstanding subsection 5(1), are not required to conduct environmental assessments of those projects, and

(ii) federal authorities for whom the requirements under this Act in respect of those projects, other than those set out in subsections 20(1) and 37(1), are deemed to be satisfied by the environmental assessment of those projects whose conduct the Crown corporation ensures;

(i.2) for the purposes of subparagraph (i.1) (ii), varying subsection 20(1) or 37(1) in its application to federal authorities prescribed under that subparagraph in the case of projects that are to be carried out outside Canada and outside any federal lands;

(j) for the purposes of section 8, designating Crown corporations that are not federal authorities individually or by class and respecting the manner in which those corporations or classes of corporations conduct environmental assessments of, and follow-up programs for, projects, as well as any action to be taken in respect of projects during the as-

rité fédérale exerce une attribution visée aux alinéas 5(1)b) ou c),

(v) projets à l'égard desquels l'Office Canada — Nouvelle-Écosse des hydrocarbures extracôtiers constitué en application de la *Loi de mise en oeuvre de l'Accord Canada — Nouvelle-Écosse sur les hydrocarbures extracôtiers*, l'Office Canada — Terre-Neuve des hydrocarbures extracôtiers constitué en application de la *Loi de mise en oeuvre de l'Accord atlantique Canada — Terre-Neuve* ou un autre organisme semblable exerce des attributions visées à l'article 5,

(vi) projets qui soulèvent des questions de sécurité nationale;

i.1) à l'égard des projets à réaliser à l'extérieur du Canada et du territoire domanial et qui font l'objet d'une évaluation environnementale à laquelle doit veiller une société d'État à laquelle la présente loi s'applique, dans les circonstances ou aux conditions prévues par règlement, désigner :

(i) les autorités fédérales qui, malgré le paragraphe 5(1), ne sont pas tenues d'effectuer une évaluation environnementale,

(ii) les autorités fédérales à l'égard desquelles les exigences prévues par la présente loi à l'égard de ces projets — autres que les exigences prévues aux paragraphes 20(1) ou 37(1) — sont réputées satisfaites par la réalisation de l'évaluation environnementale à laquelle veille la société d'État;

i.2) pour l'application du sous-alinéa i.1)(ii), modifier les paragraphes 20(1) et 37(1) à l'égard des autorités fédérales qui y sont visées dans le cas de projets à réaliser à l'extérieur du Canada et du territoire domanial;

j) pour l'application de l'article 8, désigner des sociétés d'État qui ne sont pas des autorités fédérales, individuellement ou par catégories, régir les modalités d'évaluation environnementale et celles des programmes de suivi des projets, de même que toute mesure qui doit être prise à l'égard des projets au cours du processus d'évaluation — ces modalités et mesures pouvant varier selon les sociétés ou catégories de sociétés visées;

assessment process, which manners and actions may vary by corporation or class of corporation;

(j.1) for the purposes of section 8, respecting the application to a Crown corporation that is designated, or is a member of a class that is designated, under a regulation made under paragraph (j) of the laws from time to time in force in any province;

(j.2) varying or excluding any procedure or requirement of this Act or the regulations as it applies to Crown corporations that are federal authorities, individually or by class;

(j.3) for projects to be carried out outside Canada and any federal lands, prescribing, in relation to Crown corporations to which this Act applies, any physical activity or class of physical activities in replacement of those prescribed under paragraph (b);

(k) for the purposes of section 9, respecting the manner of conducting environmental assessments of, and follow-up programs for, projects, as well as any action to be taken in respect of projects during the assessment process and, for those purposes, respecting the application of the laws from time to time in force in any province;

(k.1) prescribing the provisions of any Act of Parliament or any regulation made pursuant to an Act of Parliament that confer powers, duties or functions on a person or body referred to in subsection 9(1), the exercise or performance of which requires an environmental assessment under paragraph 9(2)(d);

(k.2) prescribing the circumstances in which an environmental assessment of a project to be carried out in whole or in part on federal lands must be conducted under paragraph 9(2)(e);

(k.3) for the purposes of section 9.1, prescribing by class authorities other than federal authorities and respecting the manner in which those classes of authorities shall conduct environmental assessments of, and follow-up programs for, projects, as well as any action to be taken in respect of projects during the assessment process — which manners and actions may vary by class of authority — and, for those purposes, respecting the

j.1) pour l'application de l'article 8, régir l'application du droit provincial en vigueur au moment de l'évaluation aux sociétés d'État ou aux catégories de sociétés d'État désignées par règlement pris au titre de l'alinéa j);

j.2) modifier ou exclure toute procédure ou exigence prévue par la présente loi ou ses règlements pour son application aux sociétés d'État mères qui sont des autorités fédérales, individuellement ou par catégories;

j.3) à l'égard des projets à réaliser à l'extérieur du Canada et du territoire domanial et à l'égard des sociétés d'État auxquelles la présente loi s'applique, désigner une activité concrète ou une catégorie d'activités concrètes, en remplacement de celles qui sont désignées en vertu de l'alinéa b);

k) pour l'application de l'article 9, régir les modalités des évaluations environnementales et celles des programmes de suivi des projets, régir toute mesure qui doit être prise à l'égard des projets au cours du processus d'évaluation et, à ces fins, régir l'application du droit provincial en vigueur au moment de l'évaluation;

k.1) déterminer les dispositions législatives ou réglementaires fédérales prévoyant les attributions des personnes ou organismes visés au paragraphe 9(1) dont l'exercice rend nécessaire une évaluation environnementale au titre de l'alinéa 9(2)d);

k.2) prévoir les cas où, pour l'application de l'alinéa 9(2)e), une évaluation environnementale doit être effectuée pour un projet devant être mis en œuvre, en tout ou en partie, sur un territoire domanial;

k.3) désigner, par catégories, les autorités, autres que des autorités fédérales, auxquelles s'applique l'article 9.1, régir les modalités des évaluations environnementales et celles des programmes de suivi des projets, de même que toute mesure qui doit être prise à l'égard des projets au cours du processus d'évaluation — ces modalités et mesures pouvant varier selon les catégories d'autorités visées — et, à ces fins, régir l'application du droit provincial en vigueur au moment de l'évaluation;

application of the laws from time to time in force in any province;

(k.4) prescribing the provisions of any Act of Parliament or any regulation made pursuant to an Act of Parliament that confer powers, duties or functions on an authority prescribed in regulations made under paragraph (k.3), the exercise or performance of which requires an environmental assessment under paragraph 9.1(2)(d);

(k.5) for the purposes of paragraph 9.1(2)(e), prescribing the circumstances in which an environmental assessment of a project to be carried out in whole or in part on federal lands must be conducted, and specifying the right or interest that the authority prescribed in regulations made under paragraph (k.3) must have in the federal lands;

(l) for the purposes of section 10, designating bands individually or by category and respecting the manner of conducting environmental assessments of, and follow-up programs for, projects that are to be carried out in whole or in part on a reserve that is set apart for the use and benefit of a designated band and that is subject to the *Indian Act*, as well as any action to be taken in respect of projects during the assessment process, which manners and actions may vary by band or category of band;

(l.001) prescribing, for the purposes of paragraph 10(1)(c), provisions of any Act of Parliament or any instrument made under an Act of Parliament that confer powers, duties or functions on a band council;

(l.01) for the purposes of section 10.1,

(i) varying the definition “project” in subsection 2(1),

(ii) respecting the manner of conducting environmental assessments of, and follow-up programs for, projects for which the Canadian International Development Agency exercises a power or performs a duty or function referred to in subsection 10.1(2) and respecting any action to be taken in respect of those projects during the assessment process,

(iii) providing that, in the case of a project in respect of which an agreement or ar-

k.4) déterminer les dispositions législatives ou réglementaires fédérales prévoyant les attributions des autorités désignées en vertu de l’alinéa k.3) relativement à un projet dont l’exercice rend nécessaire une évaluation environnementale au titre de l’alinéa 9.1(2)d);

k.5) pour l’application de l’alinéa 9.1(2)e), prévoir le cas où une évaluation environnementale doit être effectuée pour un projet devant être mis en œuvre, en tout ou en partie, sur un territoire domanial et préciser les droits ou intérêts que l’autorité désignée en vertu de l’alinéa k.3) doit avoir sur le territoire domanial;

l) pour l’application de l’article 10, régir les modalités des évaluations environnementales et celles des programmes de suivi des projets réalisés en tout ou en partie sur une réserve mise de côté à l’usage et au profit d’une bande visée, individuellement ou par catégorie, par le règlement et assujettie à la *Loi sur les Indiens*, et régir toute mesure qui doit être prise à l’égard des projets au cours du processus d’évaluation, ces modalités et mesures pouvant varier selon les bandes ou catégories de bandes visées;

l.001) déterminer, pour l’application de l’alinéa 10(1)c), les dispositions de toute loi fédérale ou de ses textes d’application prévoyant les attributions d’un conseil de bande;

l.01) pour l’application de l’article 10.1 :

(i) modifier la définition de « projet », au paragraphe 2(1),

(ii) régir les modalités des évaluations environnementales et celles des programmes de suivi des projets à l’égard desquels l’Agence canadienne de développement international exerce une attribution au titre du paragraphe 10.1(2), de même que toute mesure devant être prise à l’égard de ces projets au cours du processus d’évaluation,

(iii) prévoir qu’aucune obligation d’effectuer une évaluation environnementale n’incombe à l’Agence canadienne de développement international à l’égard de tout projet visé par un accord prévu au paragraphe 54(2) auquel elle est partie,

rangement entered into by the Canadian International Development Agency in accordance with subsection 54(2) applies, no environmental assessment need be carried out by that agency,

(iv) varying or excluding any of the provisions of section 54 in their application to the Canadian International Development Agency, or

(v) providing for the application of section 55.6 to the Canadian International Development Agency as if it were a responsible authority;

(l.02) varying or excluding any of the provisions of sections 55 to 55.5 in their application to the Canadian International Development Agency;

(l.03) prescribing, for the purposes of subsection 18(3), circumstances in which a responsible authority shall give the public an opportunity to participate in the screening;

(l.1) respecting a participant funding program referred to in subsection 58(1.1);

(m) prescribing anything that, by this Act, is to be prescribed; and

(n) generally, for carrying out the purposes and provisions of this Act.

1992, c. 37, s. 59; 1993, c. 34, s. 40(F); 1994, c. 46, s. 5; 1998, c. 10, s. 166; 2003, c. 9, s. 29.

Variation of
procedures

60. Notwithstanding this or any other Act of Parliament, where the Governor in Council is of the opinion that a federal authority on which duties and functions are imposed under this Act is unable to perform those duties and functions by reason of a time limitation or other procedural requirement that is binding on the federal authority under an Act of Parliament other than this Act or any regulation made under such an Act, the Governor in Council may, on the recommendation of the Minister and the Minister responsible for the administration of that other Act, make regulations varying the time limitation or other procedural requirement in so far as it applies to those duties and functions and to the extent necessary to permit the federal authority to perform them.

(iv) modifier ou exclure tout ou partie de l'article 54 pour l'application de celui-ci à l'Agence canadienne de développement international,

(v) rendre l'article 55.6 applicable à l'Agence canadienne de développement international comme si elle était une autorité responsable;

l.02) modifier ou exclure tout ou partie des articles 55 à 55.5 pour l'application de ceux-ci à l'Agence canadienne de développement international;

l.03) pour l'application du paragraphe 18(3), prévoir les cas où l'autorité responsable est tenue de donner au public la possibilité de participer à l'examen préalable;

l.1) prendre toute mesure relativement au fonds de participation mentionné au paragraphe 58(1.1);

m) prendre toute mesure d'ordre réglementaire prévue par la présente loi;

n) prendre toute autre mesure d'application de la présente loi.

1992, ch. 37, art. 59; 1993, ch. 34, art. 40(F); 1994, ch. 46, art. 5; 1998, ch. 10, art. 166; 2003, ch. 9, art. 29.

Modification de
la procédure

60. Malgré les autres dispositions de la présente loi ou toute autre loi fédérale, le gouverneur en conseil peut, s'il estime qu'une autorité fédérale assujettie à la présente loi ne peut remplir ses obligations en raison des délais impartis ou de toute autre formalité prévue sous le régime d'une autre loi fédérale ou de ses règlements, prendre, sur la recommandation du ministre et du ministre responsable de l'application de cette autre loi, des règlements visant à modifier ces délais et formalités dans la mesure où ils s'appliquent à ces obligations et dans la mesure nécessaire pour permettre à l'autorité fédérale de remplir les obligations qui lui incombent sous le régime de la présente loi.

	CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY	AGENCE CANADIENNE D'ÉVALUATION ENVIRONNEMENTALE	
Agency established	61. (1) There is hereby established an agency, to be called the Canadian Environmental Assessment Agency, which shall advise and assist the Minister in performing the duties and functions conferred on the Minister by this Act.	61. (1) Est constituée l'Agence canadienne d'évaluation environnementale chargée de conseiller et d'assister le ministre dans l'exercice des attributions qui lui sont conférées par la présente loi.	Constitution
Responsibility of Minister	(2) The Minister is responsible for the Agency.	(2) L'Agence est placée sous la responsabilité du ministre.	Responsabilité du ministre
Objects of Agency	62. The objects of the Agency are (a) to administer the environmental assessment process and any other requirements and procedures established by this Act and the regulations; (b) to promote uniformity and harmonization in the assessment of environmental effects across Canada at all levels of government; (c) to promote or conduct research in matters of environmental assessment and to encourage the development of environmental assessment techniques and practices, including testing programs, alone or in cooperation with other agencies or organizations; (d) to promote environmental assessment in a manner that is consistent with the purposes of this Act; (e) to promote, monitor and facilitate compliance with this Act and the regulations; (f) to promote and monitor the quality of assessments conducted under this Act; (g) to ensure an opportunity for timely public participation in the environmental assessment process; and (h) to engage in consultation with aboriginal peoples on policy issues related to this Act. 1992, c. 37, s. 62; 2003, c. 9, s. 30.	62. L'Agence a pour mission : (a) de gérer le processus d'évaluation environnementale et toute autre procédure ou exigence établis par la présente loi conformément à celle-ci et aux règlements; (b) de promouvoir l'uniformisation et l'harmonisation des processus d'évaluation des effets environnementaux à l'échelle du Canada et à tous les niveaux administratifs; (c) de promouvoir, seule ou en collaboration avec d'autres organismes, la recherche en matière d'évaluation environnementale, de mener des recherches en cette matière et de favoriser l'élaboration de techniques en cette matière, notamment en ce qui a trait aux programmes d'essais; (d) de promouvoir les évaluations environnementales conformément à l'objet de la présente loi; (e) de promouvoir, de surveiller et de faciliter l'observation de la présente loi et de ses règlements; (f) de promouvoir et de contrôler la qualité des évaluations effectuées sous le régime de la présente loi; (g) de veiller à ce que le public ait la possibilité de participer au processus d'évaluation environnementale en temps opportun; (h) de tenir des consultations avec les peuples autochtones au sujet des questions de politique liées à la présente loi. 1992, ch. 37, art. 62; 2003, ch. 9, art. 30.	Mission
Duties of Agency	63. (1) In carrying out its objects, the Agency shall (a) provide administrative support for mediators and review panels; (b) provide, on the request of the Minister, administrative support for any research or	63. (1) Dans l'exécution de sa mission, l'Agence : (a) fournit un soutien administratif aux médiateurs et aux commissions d'évaluation environnementale;	Attributions de l'Agence

advisory body that the Minister may establish in the area of environmental assessment;

(c) provide information or training to facilitate the conduct of environmental assessments; and

(d) establish and lead a quality assurance program for assessments conducted under this Act.

Powers of
Agency

(2) In carrying out its objects, the Agency may

(a) undertake studies or activities or conduct research relating to environmental assessment;

(b) advise persons and organizations on matters relating to the assessment of environmental effects;

(b.1) coordinate the development of a response to a report required under paragraph 37(1.1)(a);

(c) negotiate agreements referred to in paragraph 58(1)(c) or (d) on behalf of the Minister;

(d) examine and from time to time report to the Minister on the implementation of the environmental assessment process by responsible authorities;

(e) issue guidelines regarding the records to be kept by responsible authorities in relation to the environmental assessment process concerning projects;

(f) assist parties in building consensus and resolving disputes; and

(g) request federal authorities, and persons and bodies referred to in sections 8 to 10, to provide information respecting assessments that they conduct under this Act.

1992, c. 37, s. 63; 2003, c. 9, s. 31.

Government
facilities

64. In exercising its powers and performing its duties and functions under this Act, the Agency shall, where appropriate, make use of the services and facilities of departments, boards and agencies of the Government of Canada.

b) à la demande du ministre, fournit un soutien administratif aux organismes de recherche et de consultation en matière d'évaluation environnementale que le ministre peut créer;

c) fournit toute information ou formation en vue de faciliter l'application du processus établi par la présente loi et les règlements;

d) établit et dirige un programme d'assurance de la qualité pour les évaluations effectuées sous le régime de la présente loi.

(2) Dans l'exécution de sa mission, l'Agence peut :

a) mener des études, entreprendre des travaux ou mener des recherches en matière d'évaluation environnementale;

b) conseiller toute personne ou tout organisme en matière d'évaluation des effets environnementaux;

b.1) coordonner l'élaboration de la suite à donner au rapport au titre du paragraphe 37(1.1);

c) négocier au nom du ministre les accords prévus aux alinéas 58(1)c) et d);

d) examiner l'application du processus d'évaluation environnementale par les autorités responsables et en faire rapport au ministre;

e) établir des lignes directrices relativement aux documents que celles-ci doivent conserver à l'égard du processus d'évaluation environnementale de projets;

f) aider les parties à parvenir à un consensus et favoriser le règlement de leur différend;

g) demander aux autorités fédérales, et aux personnes ou organismes visés à l'un ou l'autre des articles 8 à 10, qu'ils lui fournissent tout renseignement concernant une évaluation effectuée sous le régime de la présente loi.

1992, ch. 37, art. 63; 2003, ch. 9, art. 31.

64. Dans l'exercice de ses attributions, l'Agence fait usage, en tant que de besoin, des installations et services des ministères et organismes fédéraux.

Idem

Usage des
services
fédéraux

President	65. (1) The Governor in Council shall appoint an officer to be called the President of the Agency, to hold office during pleasure, who shall be, for the purposes of this Act, a deputy of the Minister.	65. (1) Le gouverneur en conseil nommé à titre amovible le président de l'Agence; celui-ci a, pour l'application de la présente loi, rang d'administrateur général de ministère.	Président
Idem	(2) The President shall be the chief executive officer of the Agency, and may exercise all of the powers of the Minister under this Act as authorized by the Minister.	(2) Le président est le premier dirigeant de l'Agence et peut exercer les pouvoirs que la présente loi confère au ministre et que celui-ci l'autorise à exercer.	Idem
Acting President	(3) Subject to subsection (5), in the event of the absence or incapacity of the President or a vacancy in that office, the Executive Vice-President shall act as, and exercise the powers of, the President for the time being.	(3) Sous réserve du paragraphe (5), en cas d'absence ou d'empêchement du président ou de vacance de son poste, l'intérim est assuré par le premier vice-président.	Absence ou empêchement
Idem	(4) Subject to subsection (5), the Minister may appoint a person other than the Executive Vice-President to act as the President for the time being.	(4) Sous réserve du paragraphe (5), le ministre peut nommer une autre personne que le premier vice-président pour assurer l'intérim.	Idem
Approval required	(5) The Executive Vice-President, or a person appointed pursuant to subsection (4), shall not act as the President for a period exceeding ninety days without the approval of the Governor in Council.	(5) Le premier vice-président ou une personne nommée aux termes du paragraphe (4) ne peut assurer l'intérim que pour une période de quatre-vingt-dix jours, sauf approbation du gouverneur en conseil.	Approbation du gouverneur en conseil
Executive Vice-President	66. (1) The Governor in Council may appoint an officer, to be called the Executive Vice-President of the Agency, to hold office during pleasure.	66. (1) Le gouverneur en conseil peut nommer à titre amovible le premier vice-président de l'Agence.	Premier vice-président
Powers, duties and functions	(2) The Executive Vice-President shall exercise such powers and perform such duties and functions as the President may assign.	(2) Le premier vice-président exerce les pouvoirs et fonctions que lui attribue le président.	Pouvoirs et fonctions
Remuneration	67. The President and the Executive Vice-President shall be paid such remuneration as the Governor in Council may fix.	67. Les président et premier vice-président reçoivent la rémunération fixée par le gouverneur en conseil.	Rémunération
Appointment under the <i>Public Service Employment Act</i>	68. The officers and employees necessary to carry out the work of the Agency shall be appointed in accordance with the <i>Public Service Employment Act</i> .	68. Le personnel nécessaire à l'exécution des travaux de l'Agence est nommé conformément à la <i>Loi sur l'emploi dans la fonction publique</i> .	Nominations : <i>Loi sur l'emploi dans la fonction publique</i>
Head office	69. The head office of the Agency shall be in the National Capital Region described in the schedule to the <i>National Capital Act</i> .	69. Le siège de l'Agence est fixé dans la région de la capitale nationale définie à l'annexe de la <i>Loi sur la capitale nationale</i> .	Siège
Contracts, etc., binding on Her Majesty	70. (1) Every contract, memorandum of understanding and arrangement entered into by the Agency in its own name is binding on Her Majesty in right of Canada to the same extent as it is binding on the Agency.	70. (1) Les contrats ou ententes conclus par l'Agence sous son propre nom lient Sa Majesté du chef du Canada au même titre qu'elle-même.	Contrats
Legal proceedings	(2) Actions, suits or other legal proceedings in respect of any right or obligation acquired or incurred by the Agency, whether in its own	(2) À l'égard des droits et obligations qu'elle assume sous le nom de Sa Majesté du chef du Canada ou le sien, l'Agence peut ester	Actions en justice

name or in the name of Her Majesty in right of Canada, may be brought or taken by or against the Agency in the name of the Agency in any court that would have jurisdiction if the Agency were a corporation that is not an agent of Her Majesty.

en justice sous son propre nom devant tout tribunal qui serait compétent si elle était dotée de la personnalité morale et n'avait pas la qualité de mandataire de Sa Majesté.

ANNUAL REPORT

Annual report to Parliament

71. (1) The Minister shall report annually to Parliament, within four months after the end of the fiscal year being reported, on the activities of the Agency and the administration and implementation of this Act and regulations during that year.

Statistical summary to be included

(2) The annual report to Parliament referred to in subsection (1) shall include a statistical summary of all environmental assessments conducted or completed, under the authority of this Act during the fiscal year being reported.

RAPPORT ANNUEL

Rapport annuel du ministre

71. (1) Dans les quatre mois suivant la fin de chaque exercice, le ministre établit un rapport sur l'application de la présente loi et de ses règlements et les activités de l'Agence au cours de l'exercice précédent et le fait déposer devant le Parlement.

(2) Le rapport contient le résumé statistique des évaluations environnementales effectuées ou terminées en application de la présente loi au cours de l'exercice visé.

Contenu du rapport

REVIEW

Review

72. (1) Five years after the coming into force of this section, a comprehensive review of the provisions and operation of this Act shall be undertaken by the Minister.

Report to Parliament

(2) The Minister shall, within one year after a review is undertaken pursuant to subsection (1) or within such further time as the House of Commons may authorize, submit a report on the review to Parliament including a statement of any changes the Minister recommends.

1992, c. 37, s. 72; 1993, c. 34, s. 41(F); 1994, c. 26, s. 24(F).

EXAMEN

Examen

72. (1) Cinq ans après l'entrée en vigueur du présent article, un examen complet des dispositions et de l'application de la présente loi doit être fait par le ministre.

(2) Dans l'année qui suit le début de l'examen ou dans le délai supérieur que la Chambre des communes lui accorde, le ministre remet son rapport, accompagné des modifications de la présente loi ou des modalités d'application de celle-ci qu'il recommande, au Parlement.

1992, ch. 37, art. 72; 1993, ch. 34, art. 41(F); 1994, ch. 26, art. 24(F).

Rapport au Parlement

TRANSITIONAL

Employment continued

73. (1) Each person employed in the Federal Environmental Assessment Review Office, or seconded to that Office from any portion of the public service of Canada, on the day preceding the day on which section 61 comes into force is deemed to have been appointed pursuant to section 68 or seconded, as the case may be, to a position in the Agency of the same occupational nature and at the same level as the position occupied by the person on that preceding day.

Probation

(2) Notwithstanding section 28 of the *Public Service Employment Act*, no person who is deemed under subsection (1) to have been appointed to a position in the Agency is subject to probation unless the person was subject to pro-

DISPOSITIONS TRANSITOIRES

Maintien en poste

73. (1) Les membres du personnel du Bureau fédéral d'examen des évaluations environnementales et les personnes détachées d'autres secteurs de l'administration publique fédérale auprès de lui et en fonctions à l'entrée en vigueur de l'article 61 deviennent membres de celui de l'Agence et sont réputés avoir été nommés à des fonctions identiques en vertu de l'article 68, ou être détachés auprès du Bureau, selon le cas, lors de cette entrée en vigueur.

(2) Par dérogation à l'article 28 de la *Loi sur l'emploi dans la fonction publique*, sont seules considérées comme stagiaires les personnes qui étaient en cours de stage la veille du jour où elles sont réputées avoir été nommées. Ces per-

Stage

bation on the day preceding the day of the deemed appointment, and any person who was so subject to probation continues subject thereto only for as long as would have been the case but for this section.

1992, c. 37, s. 73; 1993, c. 34, s. 42(F).

Guidelines
Order continued

74. (1) The *Environmental Assessment and Review Process Guidelines Order*, approved by Order in Council P.C. 1984-2132 of June 21, 1984 and registered as SOR/84-467, shall continue to apply in respect of any proposal that prior to the coming into force of this section was referred to the Minister for public review and for which an Environmental Assessment Panel was established by the Minister pursuant to that Order.

Idem

(2) The Order referred to in subsection (1) shall continue to apply in respect of any proposal for which an environmental screening or initial assessment under that Order was commenced before the coming into force of this section, but where any such proposal is referred to the Minister for public review pursuant to section 20 of that Order, this Act shall thereupon apply and the Minister may refer the project to a mediator or a review panel in accordance with section 29.

Idem

(3) Where a proponent proposes to carry out, in whole or in part, a project for which an environmental screening or an initial assessment was conducted in accordance with the Order referred to in subsection (1), and

- (a) the project did not proceed after the assessment was completed,
- (b) in the case of a project that is in relation to a physical work, the proponent proposes an undertaking in relation to that work different from that proposed when the assessment was conducted,
- (c) the manner in which the project is to be carried out has subsequently changed, or
- (d) the renewal of a licence, permit, approval or other action under a prescribed provision is sought,

the responsible authority may use or permit the use of the environmental screening or initial assessment and the report thereon to whatever extent it is appropriate to do so for the purpose of complying with section 18 or 21.

sonnes poursuivent alors leur stage jusqu'à la fin de la période initialement prévue.

1992, ch. 37, art. 73; 1993, ch. 34, art. 42(F).

74. (1) Le *Décret sur les lignes directrices visant le processus d'évaluation et d'examen en matière d'environnement* approuvé par le décret C.P. 1984-2132 du 21 juin 1984 et enregistré sous le numéro DORS/84-467 continue de s'appliquer aux examens publics qui y sont visés et pour lesquels les membres de la commission d'évaluation environnementale ont été nommés sous son régime avant l'entrée en vigueur du présent article.

(2) Le décret visé au paragraphe (1) continue de s'appliquer aux examens préalables ou aux évaluations initiales commencés sous son régime avant l'entrée en vigueur du présent article, jusqu'au moment où, le cas échéant, une proposition est soumise au ministre pour examen public aux termes de l'article 20 du décret, auquel cas la présente loi commence de s'appliquer et le ministre peut prendre une décision aux termes de l'article 29.

(3) Dans le cas où un promoteur propose la réalisation de tout ou partie d'un projet à l'égard duquel l'examen préalable ou l'évaluation initiale a été effectuée sous le régime du décret visé au paragraphe (1), l'autorité responsable peut utiliser le rapport de l'examen ou de l'évaluation, ou en permettre l'utilisation, dans la mesure appropriée pour l'observation des articles 18 ou 21 dans chacun des cas suivants :

- a) le projet n'a pas été réalisé après l'achèvement de l'évaluation;
- b) le promoteur d'un projet lié à un ouvrage en propose une réalisation différente de celle qui était proposée au moment de l'évaluation;
- c) les modalités de réalisation du projet sont nouvelles;
- d) la présentation d'une demande de renouvellement d'un permis, d'une licence, d'une autorisation ou d'une autre mesure en vertu d'une disposition désignée par règlement.

Maintien de
l'application du
décret

Examens
préalables en
cours et
évaluations
initiales

Utilisation d'une
évaluation
antérieure

Idem	<p>(4) Where the construction or operation of a physical work or the carrying out of a physical activity was initiated before June 22, 1984, this Act shall not apply in respect of the issuance or renewal of a licence, permit, approval or other action under a prescribed provision in respect of the project unless the issuance or renewal entails a modification, decommissioning, abandonment or other alteration to the project, in whole or in part.</p>	<p>(4) Dans les cas où la construction ou l'exploitation d'un ouvrage ou la réalisation d'une activité concrète a été entamée avant le 22 juin 1984, la présente loi ne s'applique à la délivrance ou au renouvellement d'une licence, d'un permis, d'une autorisation ou à la prise d'une autre mesure en vertu d'une disposition désignée par règlement à l'égard du projet que si telle mesure entraîne la modification, la désaffectation ou la fermeture d'un ouvrage en tout ou en partie.</p>	<p>Commencement des activités antérieur au 22 juin 1984</p>
	<p>CONSEQUENTIAL AMENDMENTS</p> <p>75. to 81. [Amendments]</p>	<p>MODIFICATIONS CORRÉLATIVES</p> <p>75. à 81. [Modifications]</p>	
Coming into force	<p>COMING INTO FORCE</p> <p>*82. This Act, or any provision of this Act, shall come into force on a day or days to be fixed by order of the Governor in Council.</p> <p>* [Note: Sections 61 to 70, 73, 75 and 78 to 80 in force December 22, 1994, <i>see</i> SI/95-3; sections 1 to 60, 71, 72, 74, 76 and 77 in force January 19, 1995, <i>see</i> SI/95-11.]</p>	<p>ENTRÉE EN VIGUEUR</p> <p>*82. La présente loi ou telle de ses dispositions entre en vigueur à la date ou aux dates fixées par décret du gouverneur en conseil.</p> <p>* [Note : Articles 61 à 70, 73, 75 et 78 à 80 en vigueur le 22 décembre 1994, <i>voir</i> TR/95-3; articles 1 à 60, 71, 72, 74, 76 et 77 en vigueur le 19 janvier 1995, <i>voir</i> TR/95-11.]</p>	<p>Entrée en vigueur</p>

RELATED PROVISIONS

— 2003, c. 7, s. 125

Application of
*Canadian
Environmental
Assessment Act*

125. (1) Notwithstanding section 6, the *Canadian Environmental Assessment Act* continues to apply — to the exclusion of the provisions of this Act respecting projects — in respect of a proposal for a project that was referred, before the coming into force of Part 2 of this Act, to a mediator or a review panel pursuant to that Act.

Application of
*Canadian
Environmental
Assessment Act*

(2) Notwithstanding section 6, the *Canadian Environmental Assessment Act* continues to apply — to the exclusion of the provisions of this Act respecting projects — in respect of a proposal for a project for which a screening or comprehensive study was commenced under that Act before the coming into force of Part 2 of this Act, but where the project is referred to a review panel pursuant to subsection 29(1) of that Act, that Act ceases to apply and section 63 of this Act applies as if the Minister of the Environment had agreed to a request made by the executive committee under paragraph 61(1)(b).

— 2003, c. 9, s. 32

Review

32. (1) Within seven years after this Act receives royal assent, a comprehensive review of the provisions and operation of the *Canadian Environmental Assessment Act* shall be undertaken by such committee of the Senate, of the House of Commons or of both Houses of Parliament as may be designated or established by the Senate or the House of Commons, or by both Houses of Parliament, as the case may be, for that purpose.

Report

(2) The committee referred to in subsection (1) shall, within a year after a review is undertaken pursuant to that subsection or within such further time as may be authorized by the Senate, the House of Commons or both Houses of Parliament, as the case may be, submit a report on the review to Parliament, including a statement of any changes that the committee recommends.

— 2003, c. 9, s. 33

Non-application
of amended
provisions to
assessments
already
commenced

33. Any environmental assessment or assessment of the environmental effects of a project commenced under the *Canadian Environmental Assessment Act* before this section comes into force shall be continued and completed as if this Act had not been enacted.

DISPOSITIONS CONNEXES

— 2003, ch. 7, art. 125

125. (1) Malgré l'article 6, la *Loi canadienne sur l'évaluation environnementale* continue de s'appliquer aux projets de développement qui, avant l'entrée en vigueur de la partie 2 de la présente loi, ont fait l'objet d'un renvoi à un médiateur ou à une commission en vertu de cette loi. Ces projets sont dès lors soustraits au processus mis en place par la présente loi en ce qui touche les projets de développement.

*Loi canadienne
sur l'évaluation
environnementale*

(2) Il en va de même des projets pour lesquels, avant l'entrée en vigueur de la partie 2 de la présente loi, un examen préalable ou une étude approfondie a été entrepris sous le régime de la *Loi canadienne sur l'évaluation environnementale*. Toutefois, en cas de renvoi à une commission en vertu du paragraphe 29(1) de cette loi, l'article 63 de la présente loi s'applique, le ministre de l'Environnement étant réputé avoir acquiescé à une demande faite au titre de l'alinéa 61(1)b) de la présente loi, et la *Loi canadienne sur l'évaluation environnementale* cesse de s'appliquer.

*Loi canadienne
sur l'évaluation
environnementale*

— 2003, ch. 9, art. 32

32. (1) Dans les sept ans suivant la sanction de la présente loi, un examen approfondi des dispositions et de l'application de la *Loi canadienne sur l'évaluation environnementale* doit être fait par le comité soit du Sénat, soit de la Chambre des communes, soit mixte, que le Parlement ou la chambre en question, selon le cas, désigne ou constitue à cette fin.

Examen

(2) Dans l'année qui suit le début de son examen ou dans le délai supérieur que le Parlement ou la chambre en question, selon le cas, lui accorde, le comité visé au paragraphe (1) remet son rapport au Parlement, accompagné des modifications qu'il recommande.

Rapport

— 2003, ch. 9, art. 33

33. Les évaluations environnementales ou les évaluations des effets environnementaux lancées sous le régime de la *Loi canadienne sur l'évaluation environnementale* avant l'entrée en vigueur du présent article, sont menées à terme comme si la présente loi n'avait pas été édictée.

Non-application
des
modifications
aux évaluations
en cours



National Energy
Board

Office national
de l'énergie

Reasons for Decision

**TransCanada Keystone
Pipeline GP Ltd.**

OH-1-2009

March 2010

Facilities and Toll Methodology

Canada

National Energy Board

Reasons for Decision

In the Matter of

TransCanada Keystone Pipeline GP Ltd.

Section 52 Application dated 27 February 2009
for the Keystone XL Pipeline Project

OH-1-2009

March 2010

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Glossary of Terms and Abbreviations

AB	Alberta
AFL	Alberta Federation of Labour
Alexander	Alexander First Nation No. 134
b/d	barrels per day
BP	BP Canada Energy Company
Base Keystone	Pipeline segment from Hardisty, Alberta to Haskett, Manitoba approved in OH-1-2007 and approved for expansion in OH-1-2008
Blood Tribe	Kainai First Nation
Board or NEB	National Energy Board
CAPP	Canadian Association of Petroleum Producers
CEA Act	<i>Canadian Environmental Assessment Act</i>
CEP	Communications, Energy & Paperworkers Union of Canada
CDN\$	Canadian dollars
CSA	Canadian Standards Association
CSA Z662	Canadian Standards Association Z662 Oil and Gas Pipelines System
ConocoPhillips	ConocoPhillips Canada Limited
CPCN	Certificate of Public Convenience and Necessity
Cushing Expansion	Adding 24 600 m ³ /d of capacity in Canada approved by the Board in OH-1-2008
Cushing Extension	A 473 km pipeline constructed in the U.S. from Steele City near the Nebraska/Kansas border to Cushing, Oklahoma. Built in conjunction with the Cushing Expansion facilities in Canada.
EA	environmental assessment
ERCB	Energy Resources Conservation Board
ESA	Environmental and Socio-Economic Assessment
ESR	environmental screening report
Enbridge	Enbridge Pipelines Inc.

FSIN	Federation of Saskatchewan Indian Nations
GIC Governor-in-Council	
GHG	greenhouse gas
Gulf Coast Segment	Cushing to USGC including Houston, Texas lateral
IL Illinois	
km	kilometre(s)
KSG	Keystone Shippers Group (Canadian Natural Resources Limited, ConocoPhillips Canada Marketing and trading ULC, EnCana Corporation, Shell Trading Canada, Total E&P Canada Ltd and Trafigura Canada General Partnership)
Keystone	TransCanada Keystone Pipeline GP Ltd.
Keystone XL	Keystone XL pipeline
Keystone system	Includes Base Keystone (original Keystone and Cushing expansion) and the Keystone XL Pipeline Project
Keystone US Tariff	Keystone US Petroleum Rules and Regulations
McInnes	Dale and Shirley McInnes
m ³	cubic metre(s)
m ³ /d	cubic metres per day
Mb/d	thousand barrels per day
MMb/d	million barrels per day
MPMO	Major Projects Management Office
Muse	Muse, Stancil & Co.
NEB Act or the Act	<i>National Energy Board Act</i>
Nekaneet	Nekaneet First Nation No. 380
nominal capacity	The long-term sustainable capacity of the pipeline.
OK	Oklahoma
OPR-99	<i>Onshore Pipeline Regulations, 1999</i>
PADD	Petroleum Administration for Defense District. Regions defined by the Energy Information Administration, U.S. Department of Energy that describes a market area for crude oil in the U.S.

PADD II	Region also known as the U.S. Midwest and includes the following states: Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Ohio, Oklahoma, Tennessee and Wisconsin
PADD III	Region also known as the U.S. Gulf Coast and includes New Mexico, Texas, Arkansas, Louisiana, Alabama and Mississippi.
PD	Project Description
Pentanes plus	A mixture of mainly pentanes and heavier hydrocarbons obtained from the processing of raw gas, condensate or crude oil.
PGI	Purvin & Gertz Inc.
Project	Keystone XL Pipeline Project
Red Pheasant	Red Pheasant First Nation No. 108
RoW	right-of-way
SCC	Sierra Club Canada
SK	Saskatchewan
Suncor	Suncor Energy Marketing Inc.
Sweetgrass and Moosomin	Sweetgrass and Moosomin First Nations
TK	Traditional Knowledge
TSA or TSAs	Transportation Service Agreement(s)
TWS	Temporary Work Space
TX	Texas
U.S.	United States
US\$	American dollars
USGC	United States Gulf Coast
VMSC	Valero Marketing and Supply Company
WCSB	Western Canada Sedimentary Basin

Recital and Appearances

IN THE MATTER OF the *National Energy Board Act* and the Regulations made thereunder;

IN THE MATTER OF an application dated 27 February 2009 by TransCanada Keystone Pipeline GP Ltd. for a certificate of public convenience and necessity authorizing the construction and operation of oil transmission facilities and approval of the tolls and tariff for the facilities pursuant to Parts III and IV of the *National Energy Board Act*, respectively, filed with the National Energy Board under File No. OF-Fac-Oil-T241-2009-01 01;

IN THE MATTER OF National Energy Board Hearing Order OH-1-2009 dated 12 May 2009;

HEARD in Calgary, Alberta on 15, 16, 17, 18, 21, 22, 23, 24 and 25 September and 1 and 2 October 2009;

BEFORE:

K.M. Bateman	Presiding Member
L. Mercier	Member
S.J. Snook	Member

Appearances

Participants

Witnesses

Applicant

W. M. Moreland	TransCanada Keystone Pipeline GP Ltd.
E. Swanson	

P. Miller
D. Diakow
T. Wise
K. Murchie
K. Phaff
V. Cabrejo
L. Fontana
A. Lees
J. Hunt
R. Kendel
A. McLandress

L. Chahley	Alberta Federation of Labour
------------	------------------------------

J. Custer	Sierra Club Canada
-----------	--------------------

A. L. McLarty	BP Canada Energy Company
---------------	--------------------------

D. Davies	Enbridge Pipelines Inc.
T. Hughes	

G. Jarvis
R. Fischer
N. Earnest

L. Landry	Imperial Oil Limited
-----------	----------------------

D. Carter	Dale and Shirley McInnes	D. McInnes S. McInnes
G. Nettleton	Keystone XL Shippers Group (Collectively Canadian Natural Resources Limited, Conoco Phillips Canada Marketing & Trading ULC, EnCana Corporation, Shell Trading Canada, Total E & P Canada Ltd. and Trafigura Canada Canada General Partnership)	
T. J. Richardson	Nexen Inc.	
D. Armstrong	Suncor Energy Marketing Inc.	
A. J. Dalton D. Brett	Valero Marketing and Supply Company	J. Malott
C. J. C. Page	Alberta Department of Energy	
C. M. Ozirny	Neekaneet First Nation No. 380 Red Pheasant Band No. 108	A. Pahtayken V. Sauvie
C. Beauchemin P. Ouellette	National Energy Board	

Written Arguments

Communications, Energy and Paperworkers Union Canada

Sierra Club Canada

Suncor Energy Marketing Inc.

Neekaneet First Nation No. 380 and Red Pheasant Band No. 108

Dale and Shirley McInnes

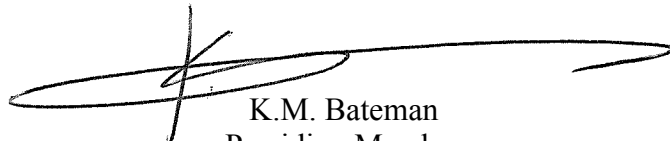
Chapter 1

Disposition

The National Energy Board (Board or NEB) finds that the proposed Keystone XL Pipeline (Keystone XL) Project is, and will be, required by the present and future public convenience and necessity, provided that the terms and conditions outlined in Appendix III, including all commitments made by TransCanada Keystone Pipeline GP Ltd. (Keystone) during the hearing process, are met. Subject to the approval of the Governor in Council, a Certificate of Public Convenience and Necessity (CPCN) incorporating the terms and conditions in Appendix III will be issued pursuant to Part III of the *National Energy Board Act*.

The Board also finds that the applied-for toll methodology will produce tolls that will be just and reasonable and not unjustly discriminatory pursuant to Part IV of the NEB Act. The Board does not approve the proposed Tariff.

The ensuing chapters constitute the Reasons for Decision in respect of the 27 February 2009 Keystone application heard by the Board in the OH-1-2009 proceeding.



K.M. Bateman
Presiding Member



L. Mercier
Member



S.J. Snook
Member

Calgary, Alberta
March 2010

Chapter 2

Background

2.1 Project Overview

On 27 February 2009, Keystone applied to the Board for a CPCN under section 52 of the *National Energy Board Act* (NEB Act or Act) authorizing Keystone to construct and operate the Keystone XL Pipeline, and for an approval pursuant to Part IV of the NEB Act for the toll methodology and tariff.

The Keystone XL Pipeline Project (the Project) consists of the construction of approximately 529 kilometres (km) of new 914 millimetre outside diameter (nominal pipe size 36 inch) pipeline from Hardisty, Alberta (AB) to Monchy, Saskatchewan (SK) (Figure 2-1). The Project will have an initial capacity of approximately 111 300 m³/d (700, 000 barrels per day (b/d)) of commodity and is designed to be expandable to 143 100 m³/d (900,000 b/d). The Project will also include related physical works including: eight pump stations, storage tanks and other related works and activities including 32 mainline valves, cathodic protection for the pipeline, and pig launcher and receiver facilities.

The Keystone XL Pipeline will be an addition to Base Keystone. In OH-1-2007, the Board approved the construction of the original Keystone pipeline from Hardisty, AB, to Haskett, Manitoba (MB). This pipeline had a capacity of 69 200 m³/d (435,000 b/d) and was supported by 54 100 m³/d (340,000 b/d) of long-term binding contracts. In OH-1-2008, the Board approved an expansion of the original Keystone pipeline. This expansion was referred to as the Cushing expansion and added 24 800 m³/d (156,000 b/d) of incremental capacity to the original Keystone pipeline. Long-term binding contracts supported 24 600 m³/d (155,000 b/d) of the incremental capacity of the Cushing expansion. The Keystone pipeline, together with the Cushing expansion, is referred to as the Base Keystone pipeline. The Base Keystone pipeline, together with the Keystone XL Project, is referred to as the Keystone system (Figure 2-2).

Projects such as the Keystone XL Project require a CPCN under section 52 of the NEB Act which triggers the requirement for an environmental assessment (EA) under the *Canadian Environmental Assessment Act* (CEA Act). Since the Project requires less than 75 km of new right-of-way (RoW), a screening level of environmental assessment under the CEA Act was required.

**Figure 2-1
Keystone XL Pipeline Project – Canadian Section**

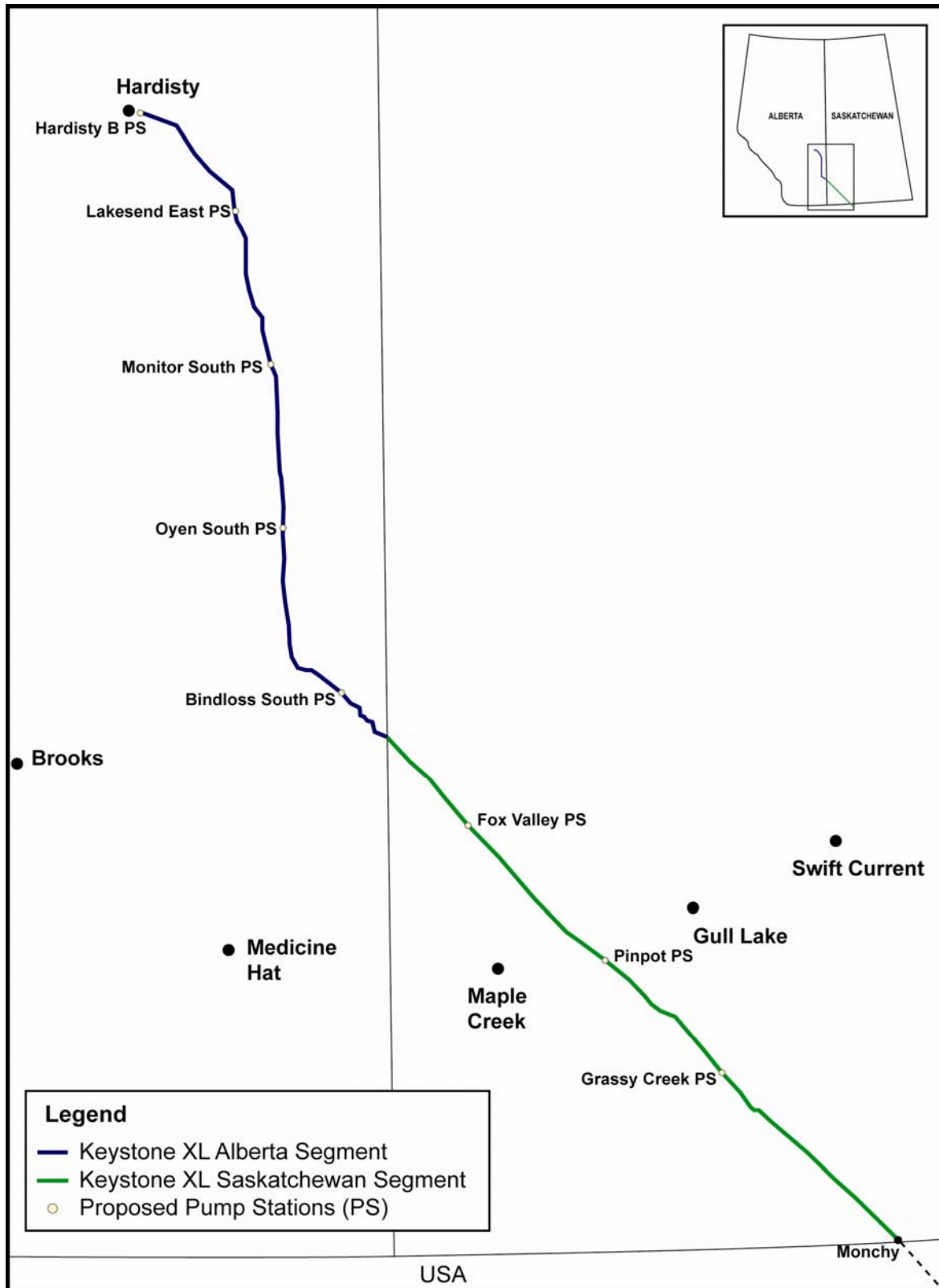
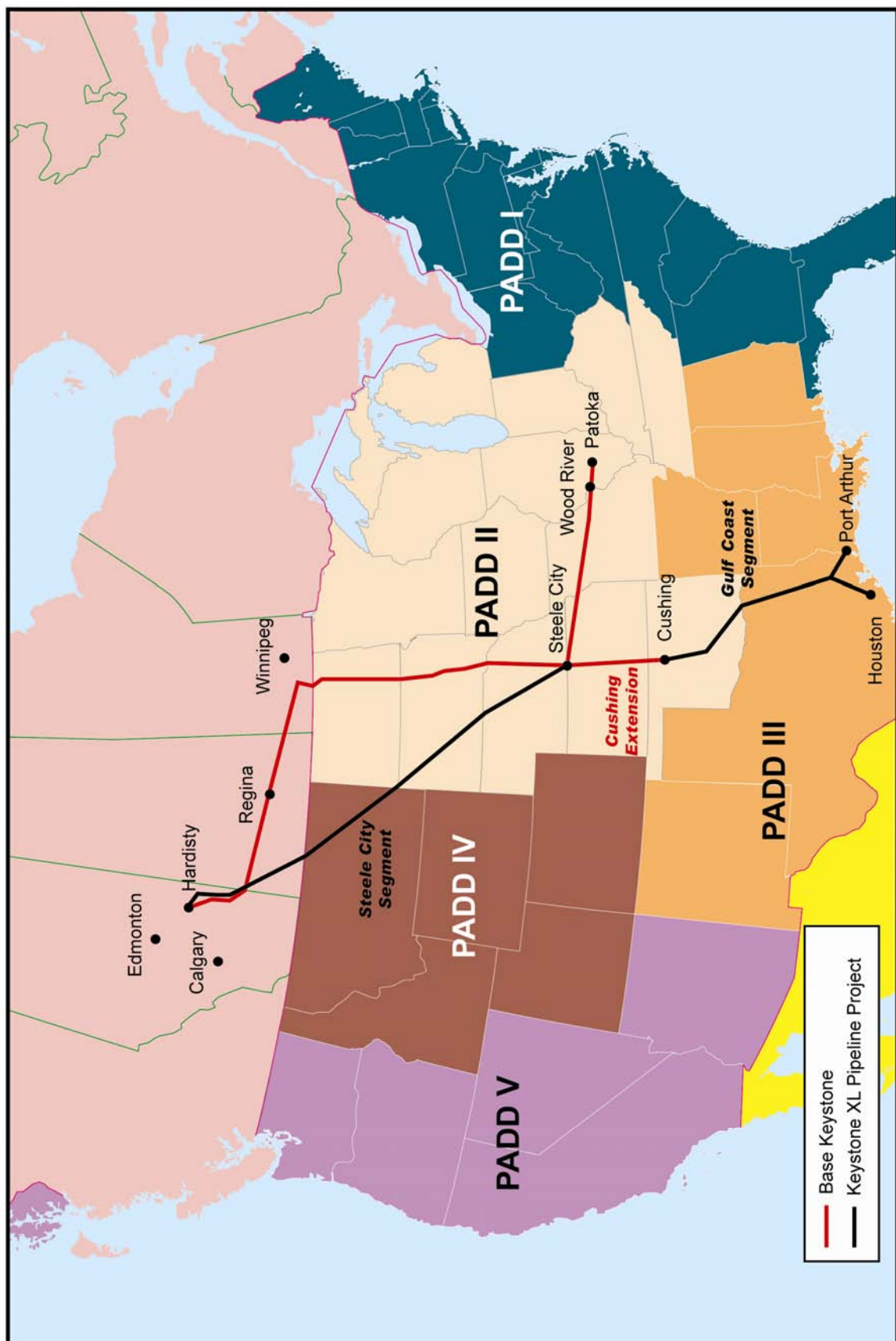


Figure 2-2
Overview of Keystone System



2.2 Regulatory Context

Keystone filed a Project Description (PD) for the proposed Project with the Board on 18 July 2008. The purpose of the PD was to initiate and facilitate an efficient regulatory review of the Project and enable the Board and other federal departments to determine their environmental assessment responsibilities and the scope of the assessment under the CEA Act.

On 27 February 2009, Keystone filed an application with the Board requesting approval to construct and operate the Canadian portion of the Keystone XL Pipeline. Keystone intended to commence construction in 2010 and be completed and in commission in late 2012.

By letter dated 12 May 2009, the Board announced that it would convene an oral public hearing beginning 15 September 2009. Hearing Order OH-1-2009 was attached to the letter and established the procedures to be followed in the hearing. Parties wanting to intervene in the proceeding were given until 9 June 2009 to apply. The Board received 25 intervenor applications by the deadline, and approved 24 of these applications for intervenor status. One application from the Indigenous Environmental Network was denied as it did not provide a description of the party's interest in the Project and was incorrectly filed by email. In addition, the Board received and approved a further five applications for late intervenor status from the Sweetgrass and Moosomin First Nations, Sierra Club Canada (SCC), Communications Energy and Paperworkers Union of Canada (CEP), Red Pheasant First Nation No. 108 and Nekaneet First Nation No. 380.

In the OH-1-2009 Hearing Order, the Board invited parties to suggest any amendments or additions to the List of Issues by 9 June 2009. The Board received comments from Dale and Shirley McInnes (McInnes), the CEP, SCC and Transport Canada.

The concerns raised by these parties related to the following:

- design and location of Pump Stations;
- Canadian energy security;
- promoting sustainable economic development of Canada's energy economy;
- Canada's obligations to reduce greenhouse gas (GHG);
- alternatives to the proposed facilities;
- cumulative environmental and socio-economic effects; and
- potential adverse impacts to potential or established Aboriginal or treaty rights.

The Board responded to parties on 19 June 2009 and advised that it would revise the List of Issues (see Appendix I) to include the following: Potential impacts of the Project on Aboriginal interests. The Board further indicated that no additional amendments or additions to the List of Issues were required as the List of Issues covered all matters raised by parties to the extent that they were relevant to the determination to be made by the Board.

The Board also requested comments from parties on the draft scope of the environmental assessment of the Project through its OH-1-2009 Hearing Order. Comments were received from

Transport Canada requesting that section 2.1 of the scope be changed to reflect the recent changes to the *Navigable Waters Protection Act*. After considering the comments received by Transport Canada, the Board revised the scope of the EA as per the request.

On 7 July 2009, the Board, taking into account the location of the Project and the interests of intervenors, announced the locations of the hearing as Calgary, AB and Saskatoon, SK. On 28 August 2009, the Board requested that the intervenors identify at which hearing location they intended to appear.

Intervenors from the Bindloss, AB, area (i.e. Mr. Daryl Swenson, Mr. Dennis Swenson, Mrs. Mary Swenson and Mr. Creston Anderson) and the McInnes' indicated that they would like to appear in Calgary, AB. Mr. David Staples of Staples Farms had previously withdrawn his intervention for the hearing on 24 August 2009. As the only remaining intervenors located in Saskatchewan were the Sweetgrass First Nation and Moosomin First Nation, and no parties had indicated that they had questions for these intervenors, these intervenors chose to adopt their evidence by way of affidavit, and did not appear at the hearing for that purpose.

Intervenor responses demonstrated little interest in the Saskatoon venue, and therefore the Board announced on 4 September 2009 that the hearing would be held in its entirety in Calgary AB.

On 9 September 2009, Mr. Daryl Swenson, Mr. Dennis Swenson and Mrs. Mary Swenson, of Swenson Farms Ltd, withdrew their interventions, and on 11 September, Mr. Creston Anderson withdrew his intervention and therefore were no longer participants in this proceeding.

The oral portion of the hearing was held in Calgary, AB from 15 to 18 September, 21 to 25 September, and 1 to 2 October 2009, for a total of 11 hearing days.

As a Responsible Authority under the CEA Act, the Board completed an Environmental Screening Report (ESR) pursuant to the CEA Act. The ESR is provided as Appendix IV. Further discussions of environmental matters are discussed in Chapter 10 of these Reasons.

Chapter 3

Economic Feasibility

The Board must consider the justification for and economic feasibility of a proposed pipeline project. To do this the Board decides whether the facilities are needed and would be used at a reasonable level over their expected economic life. Applicants must provide the Board with evidence on:

- the supply of commodities that would be shipped on the pipeline;
- the nature of the markets that would receive the products delivered by the pipeline;
- the capability of existing transportation infrastructure to meet the need that the Applicant has identified;
- the financial arrangements for the construction and ongoing operations of the proposed project; and
- whether there is a reasonable likelihood that tolls on the pipeline will be paid.

3.1 Crude Oil Supply

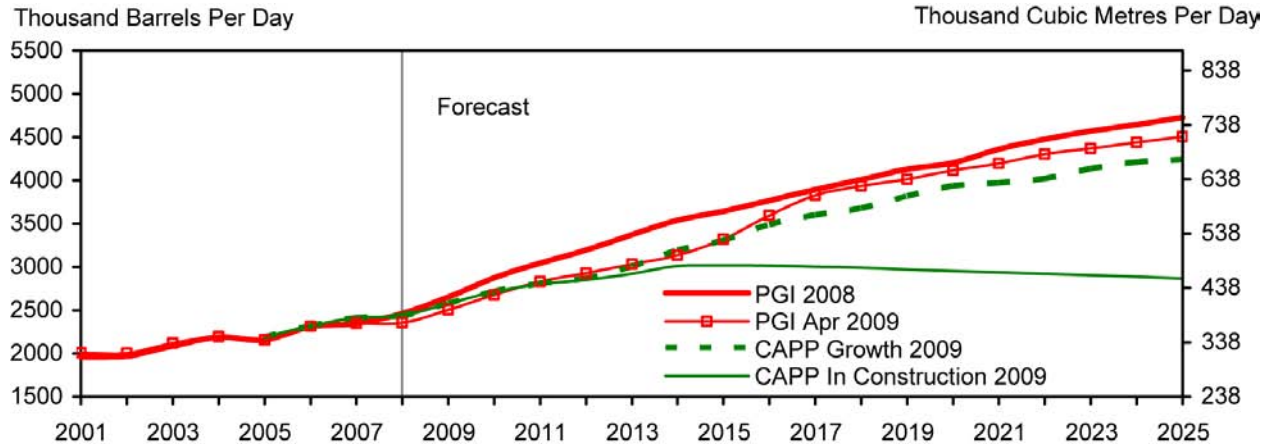
In support of its application, Keystone submitted evidence on crude oil supply in western Canada in a report prepared by Purvin & Gertz Inc. (PGI). In this report, dated 13 February 2009, PGI used its 2008 forecast for western Canada supply as a basis for its analysis. Given the significant changes to the economic environment that occurred since 2008, however, the Board requested that Keystone provide an update to its supply and markets evidence. An updated Supply and Markets report was filed as additional written evidence on 18 June 2009. The following discussion refers primarily to the most recent evidence provided by Keystone.

Keystone submitted that western Canada has substantial oil reserves due mainly to bitumen in oil sands. Keystone referred to the Canadian Association of Petroleum Producers (CAPP) estimated remaining established reserves of conventional crude oil and pentanes plus in western Canada of 585.8 million cubic metres (3.68 billion barrels) at December 31, 2006. Keystone also referred to Alberta's Energy Resources Conservation Board (ERCB) estimated remaining established reserves of crude bitumen in oil sands of 27.45 billion cubic metres (172.7 billion barrels) at the end of 2007. Keystone noted that the crude bitumen reserves are equivalent to 356 years of production at an annual bitumen production rate in 2007 of 77 million cubic metres (484 million barrels).

In its updated report, PGI projected continued growth in western Canadian crude oil supply, but at a rate lower than originally forecast. For its revised forecast, PGI considered oil sands project cancellations and deferrals, as well as the impact of a period of low crude oil prices adversely impacting future oil sands investment. Overall, the forecast projected a slowdown, but not a stoppage, in oil sands growth in 2012 to 2014 due to project decisions in 2008 and 2009, but some recovery in the 2015-2017 period. Total western Canadian supply was projected to rise from 365 700 m³/d (2.3 MMb/d) in 2006 to 476 900 m³/d (3.0 MMb/d) in 2013. By 2020, the

end of the forecast period, supply was forecast to grow to 650 800 m³/d (4.1 MMb/d) (Figure 3-1).

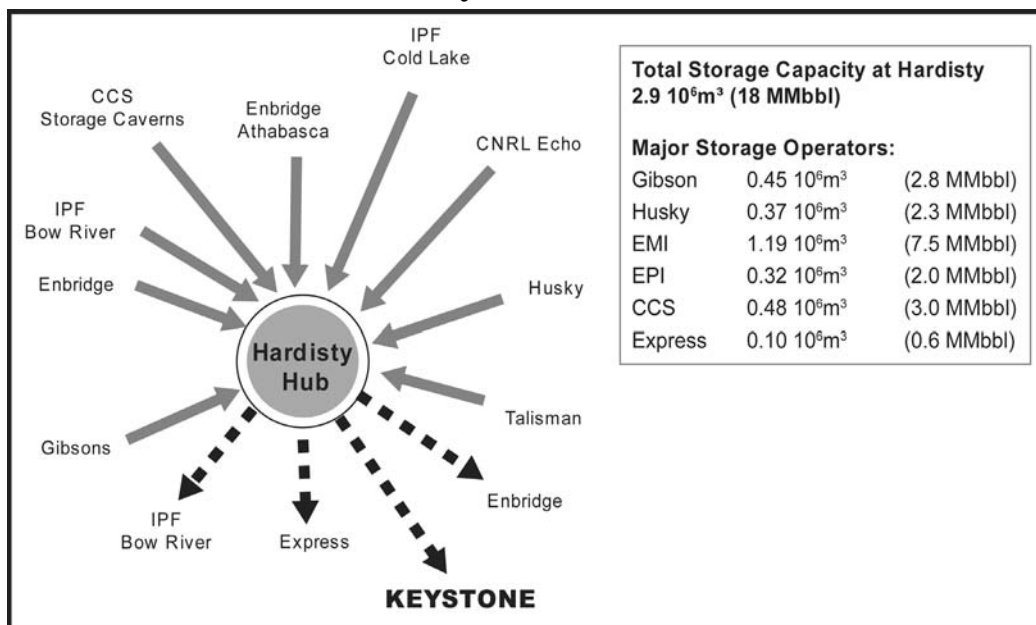
Figure 3-1
Western Canada Crude Supply Forecast Comparison



Keystone noted that the PGI April 2009 forecast is similar to CAPP's Growth 2009 forecast, until 2015, and then it is higher. The PGI western Canadian oil supply forecast submitted by Keystone was not contested by parties.

In addition to its crude oil supply outlook, Keystone provided evidence regarding access to upstream supplies. Keystone noted that Hardisty, AB is a major hub for the western Canadian petroleum industry and is connected to pipelines from Edmonton, Cold Lake, Lloydminster and Fort McMurray, AB. (Figure 3-2)

Figure 3-2
Hardisty Infrastructure



Keystone noted that there is total inbound pipeline capacity to Hardisty of approximately 445 000 m³/d (2.8 MMb/d), with additional volumes supplemented by rail and truck. It submitted that the Hardisty area has storage capacity of approximately 2.9 million cubic metres (18 million barrels). Keystone stated that this very liquid trading hub would provide the Keystone XL Pipeline with access to a wide variety of light and heavy crude supply for shipment to the United States Gulf Coast (USGC) market.

3.2 Transportation

Keystone Pipeline Capacity

Keystone submitted that the Keystone XL Pipeline would expand and complement Base Keystone, and that all Keystone system facilities would be operated on an integrated basis. Keystone submitted, however, that the Keystone XL Pipeline is not an expansion of existing infrastructure in a conventional sense, such as a line looping project or an increase of capacity on an existing line through the addition of pumps, but a bullet line facility designed primarily to satisfy volume requirements in the USGC market and operate effectively and efficiently as one part of an integrated system.

The Keystone XL Pipeline would have an initial nominal capacity of 111 300 m³/d (700 Mb/d), which would provide 79 500 m³/d (500 Mb/d) of incremental capacity to the USGC and 31 800 m³/d (200 Mb/d) of capacity to Cushing, Oklahoma (OK) via the Cushing Extension. Keystone indicated that once the Keystone XL Pipeline is in service, the Cushing Expansion facilities approved by the Board in OH-1-2008 would be required to deliver committed and spot volumes to Wood River and Patoka, Illinois (IL), and to deliver to Cushing and the USGC in the event that the capacity on the Keystone XL Pipeline is either partially or totally unavailable.

Keystone stated that, within the Keystone Pipeline System, there are four proposed US delivery points: Wood River, IL; Patoka, IL; Cushing, OK; and Port Arthur, TX. It indicated that contract shippers have each designated one of these delivery points as the primary delivery point under the transportation service agreements (TSAs). Table 3-1 provides an overview of the Keystone Pipeline System.

Table 3-1
Keystone Pipeline System

	Capacity	Contracted
Base Keystone	69 200 m ³ /d	54 100 m ³ /d
OH-1-2007	(435 Mb/d)	(340 Mb/d)
Keystone Cushing Expansion	24 800 m ³ /d	24 600 m ³ /d
OH-1-2008	(156 Mb/d)	(155 Mb/d)
Keystone XL	111 300 m ³ /d	60 400 m ³ /d
OH-1-2009	(700 Mb/d)	380 Mb/d
Total System	205 200 m ³ /d (1,291 Mb/d)	139 100 m ³ /d (875 Mb/d)

Keystone submitted that the design of the Keystone system mitigates the risk of economic loss for each of the Keystone committed shippers, the uncommitted shippers and Keystone by providing operational flexibility to deal with pipeline outages. Keystone stated that both committed and uncommitted Keystone XL shippers could be partially served by the Base Keystone system in the event of an outage on the portion of Keystone XL upstream of Steele City. Additionally, Wood River/Patoka shippers could be partially served through the Keystone XL Pipeline system, through operational tanks at Steele City, in the event of an outage on the Base Keystone system upstream of Steele City. Keystone submitted that the current design and the associated flexibility helps ensure that overall shipping commitments, to the extent possible, are maintained on both systems in the event of operational upsets.

Keystone noted that it is at-risk for non-contracted capacity on the Keystone Pipeline System and stated that it has an incentive to optimize the efficiency and overall utilization of the Canadian portion of the system.

Diversion Rights

Keystone stated that contract utilization relative to nominal capacity could also be affected by shippers taking advantage of diversion rights. Diversion rights refer to the ability of a firm shipper to nominate to an alternate delivery point on the Keystone Pipeline System from the delivery point specified in its contract. All contracted Keystone shippers would have diversion rights, including both Cushing and USGC shippers, who could choose to nominate volumes to alternate delivery points at Wood River/Patoka instead of their primary contract delivery point, in order to meet a discrete business need or market demand. Keystone indicated that spot shippers would also have the ability to nominate to any of the U.S. delivery points.

Keystone stated that there are no clause(s) addressing alternate delivery point nomination rights for shippers in any of the Canadian or American TSAs, including Base Keystone, Cushing Extension and Keystone XL. The rights to nominate to an alternate delivery point are proposed only in the Keystone U.S. Petroleum Rules and Regulations (Keystone U.S. Tariff) for U.S. contract shippers for ultimate Keystone delivery points in the U.S. Keystone indicated that it would be difficult to predict when and how U.S. contract shippers would nominate to alternate delivery points.

Western Canada Sedimentary Basin Export Pipeline Capacity

Keystone provided information regarding estimated pipeline capacity in place to export western Canadian crude oil for the year 2012; (Table 3-2) including Enbridge Pipelines Inc. (Enbridge), Trans Mountain Pipeline, Milk River, Rangeland, Express and Base Keystone to Wood River and Patoka and the Cushing Expansion. Overall, Keystone estimated export pipeline capacity for total crude at 598 100 m³/d (3.75 MMb/d), of which 260 100 m³/d (1.63 MMb/d) was for light crude and 338 100 m³/d (2.12 MMb/d) was for heavy crude.

Table 3-2
Capacities of Export Pipelines for Canadian Crudes: 2012

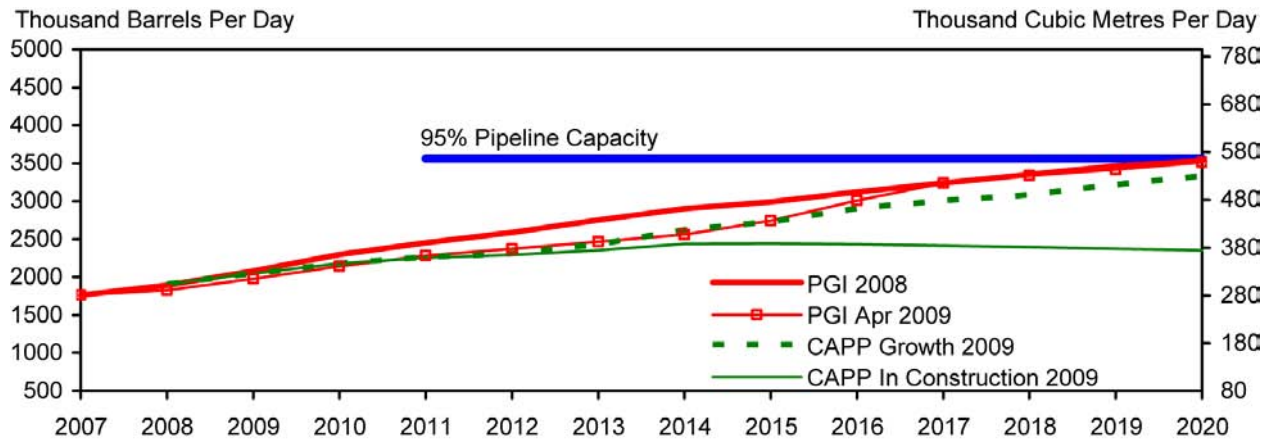
	(Thousand Barrels Per Day)			(Thousand Cubic Metres Per Day)		
	Light	Heavy	Total	Light	Heavy	Total
Enbridge ¹						
Line 1 ^a	77		77	12.2		12.2
Line 2 ^b	440		440	70.0		70.0
Line 3 ^{b,c}	500		500	79.5		79.5
Line 4 ^b		880	880		139.9	139.9
LSR ^d	186		186	29.6		29.6
Clipper ^b	-	450	450	-	71.5	71.5
Subtotal^e	1,203	1,330	2,533	191.3	211.4	402.7
Express ²	94	188	282	14.9	29.9	44.8
TransMountain ³	85	85	170	13.5	13.5	27.0
Milk River ⁴	5	113	118	0.8	18.0	18.8
Rangeland/Aurora ⁴	50	15	65	7.9	2.4	10.3
Keystone ⁵						
Phase 1-A & B	197	393	590	31.3	62.5	93.8
Total	1,634	2,124	3,758	259.7	337.7	597.5
95% of Total	1,552	2,018	3,570	246.7	320.9	567.6

- Notes:
- 1 Enbridge sources below. Crude capacities ex Cromer, Manitoba.
 - a Enbridge Pipeline System Configuration, March 2006 for total capacity = 237,000 B/D (37.6 10³m³/d). Crude capacity is reduced by delivery of refined products and natural gas liquids assumed at 160,000 B/D (25.4 10³m³/d).
 - b Enbridge Appendix 14 in Reponse to Information Request 14 of Communications, Energy & Paperworkers Union (CEP) at NEB hearing OH-4-2007, re Clipper.
 - c Source (b) includes change in Line 3 service from heavy crude to light crude
 - d Enbridge Facility Application for Southern Lights Vol. 1. pg 2-3, February, 2007 (NEB hearing OH-3-2007)
 - e Enbridge subtotal assumes sufficient takeaway capacity from Superior to Chicago and Marysville.
 - 2 Source: Kinder Morgan website\business\Canada for total crude capacity. Express heavy crude assumed = 2/3 of total crude.
 - 3 Source: Terasen Pipelines Inc. Facility Application for Trans Mountain Pipeline Anchor Loop, pg 2-4, Feb. 17, 2006. For total capacity = 300,000 B/D (47.7 10³m³/d). Export capacity is reduced by domestic delivery of light crude and refined products assumed at 130,000 B/D (20.7 10³m³/d). TransMountain crude capacity assumed at half light crude for Washington.
 - 4 Purvin & Gertz estimates
 - 5 Keystone heavy assumed at 2/3 of total crude.

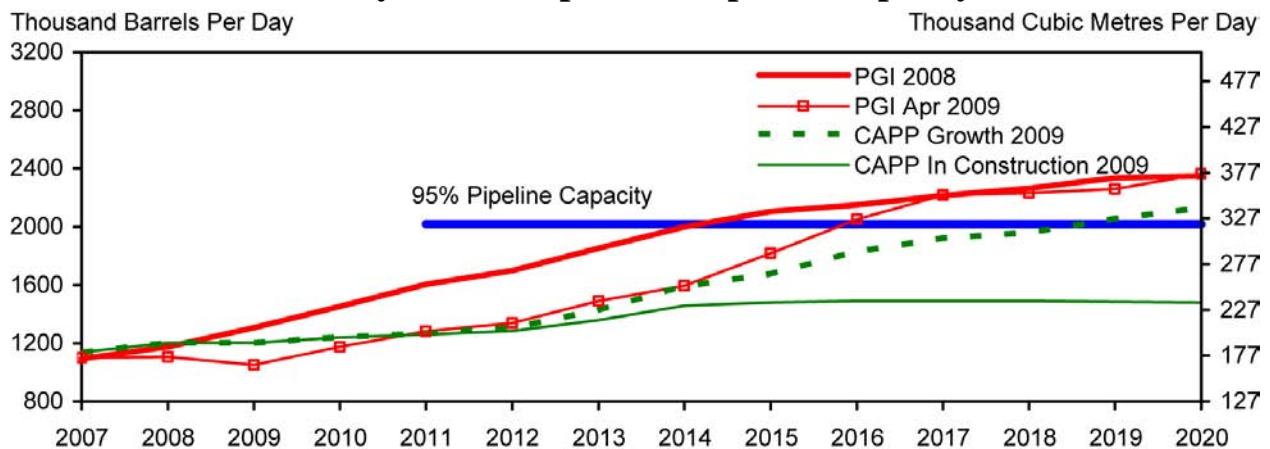
In order to determine the requirement for additional pipeline capacity from western Canada, Keystone submitted the PGI analysis, which used an annualized pipeline service factor of 95 percent of capacity, and export projections based on the crude oil supply forecasts, less the disposition forecast for western Canada. Based on its own supply forecast, the PGI analysis concluded that additional pipeline capacity for total crude would be needed around 2020. (Figure 3-3) Based on the CAPP Growth 2009 forecast, exports are slightly lower in 2020, delaying the need for pipeline capacity for approximately another two years.

PGI stated that pipeline capacity depends in part on the properties of the commodities being shipped on the pipelines. Compared with light crude oil, heavy crude reduces pipeline capacity. In this connection, PGI concluded that additional heavy crude pipeline capacity would be needed by 2015 - 2016 to accommodate forecast heavy crude supply. The CAPP Growth 2009 forecast suggests the need for more pipeline capacity for heavy crude would arise around 2018. (Figure 3-4)

**Figure 3-3
Total Crude Exports vs. Pipeline Capacity**



**Figure 3-4
Heavy Crude Exports vs Pipeline Capacity**



Keystone submitted that some degree of excess pipeline capacity is desirable to allow flexibility for shippers to react to changes in market conditions. It stated that the appropriate level of excess capacity depends on the markets served by that pipeline capacity, the configuration and flexibility of the pipeline systems, the number of different owners and operators of those pipeline systems, and how the systems are managed. Keystone indicated that an appropriate level of excess capacity would perhaps be 20 to 25 per cent.

Keystone submitted that no excess capacity currently exists between western Canada and the USGC. Currently, western Canadian crude oil can access the USGC only indirectly through the Pegasus Pipeline, which has a capacity of less than 15 900 m³/d (100 Mb/d). Keystone submitted that it is pursuing the Keystone XL Pipeline in response to its shippers who want to have access to the USGC in the 2012 timeframe.

3.3 Markets

The USGC is located in PADD III, which includes the states from New Mexico to Mississippi. Keystone submitted that PADD III has the largest refining system in the world, with approximately 1.3 million m³/d (8.4 MMb/d) of crude refining capacity, mainly at the USGC in Texas and Louisiana.

Keystone submitted that the large PADD III market currently accesses very little Canadian crude oil, even though refineries in this market have a large coking capacity and can process significant amounts of heavy crude oil similar to Canadian bitumen blends. Imports of crude oil to the USGC will likely increase due to rising demand by U.S. refineries and the decline of U.S. domestic supply. As well, traditional supply sources of heavy crude for the USGC including Mexico and Venezuela are declining, as a result some USGC refiners are seeking to diversify their supply sources by obtaining access to western Canadian crude.

The Keystone XL Pipeline could deliver Canadian crudes to 15 refineries, situated near Port Arthur and Houston, as well as Texas City and Lake Charles, Louisiana. (Table 3-3) By 2011, the total refining market available to the Keystone XL Pipeline would be 684 000 m³/d (4.3 MMb/d). PGI's evidence was that the USGC market could absorb at least an incremental 79 500 m³/d (500 Mb/d) of Canadian crude, representing approximately 12 per cent of the crude capacity of the refineries in the Port Arthur, Houston, Texas City and Lake Charles areas.

Table 3-3
USGC Refining Market Available to the Keystone Pipeline

Refinery	m ³ /d (x 1,000)	b/d (x 1,000)
Valero Energy, Port Arthur	45.9	289
Motiva Enterprises, Port Arthur	45.3	285
Motiva Enterprises Expansion, Port Arthur ¹	51.7	325
Total Petrochemicals, Port Arthur	36.9	232
ExxonMobil Corp, Beaumont	55.4	349
Subtotal: Port Arthur Area	235.2	1,480
Valero Energy, Houston	13.2	83
Houston Refining (Lyondell), Houston	43.1	271
Pasadena Refining, Pasadena	15.9	100
Shell Deer Park, Deer Park	52.5	330
ExxonMobil Corp, Baytown	90.1	567
Subtotal: Houston Area	214.8	1,351
BP, Texas City	76.0	478
Marathon Oil, Texas City	12.1	76
Valero Energy, Texas City	31.8	200
Subtotal: Texas City Area	119.9	754
Calcasieu Refining, Lake Charles	8.4	53
CITGO, Lake Charles	68.3	430
ConocoPhillips, Lake Charles	38.0	239
Subtotal: Lake Charles Area	114.7	722
Total Refining Market	684.6	4,307

1 This expansion is planned to be complete by 2012.

Heavy crude runs for the target refineries in Table 3-3 were estimated by PGI at 227 700 m³/d (1.43 MMb/d) for 2007, nearly all of which were imported. Additionally, light crude runs in

2007 were estimated at 294 000 m³/d (1.85 MMb/d), of which 248 600 m³/d (1.57 MMb/d) were imported.

3.4 Shipper Commitments and Project Financing

3.4.1 Shipper Commitments

In the summer of 2008, Keystone conducted an open season for the subscription of firm transportation service on the proposed Keystone XL Pipeline. As a result of the open season, Canadian Natural Resources (CNRL), EnCana, Shell Marketing Canada, Trafigura Canada General Partnership, ConocoPhillips Canada Limited (ConocoPhillips), Total E&P and Valero Energy Corporation (Valero) executed TSAs totaling 60 400 m³/d (380 Mb/d), for an average term of 17 years.

Keystone submitted that the TSAs demonstrate material endorsement and commercial support for the Project, as well as the need for incremental pipeline capacity and market access to the USGC for Canadian crude oil producers and USGC refiners.

Keystone advised that in consideration of the changing market, in 2009 it sought and reaffirmed each shipper's support for the Project.

3.4.2 Project Financing

In its application, Keystone stated that it would obtain the funds required for the construction of the \$1.7 billion Project from its partners, their affiliates, and their parent companies, TransCanada Corporation and ConocoPhillips. On 16 June 2009, TransCanada Corporation announced it would acquire ConocoPhillips' interest in the pipeline and become the sole owner of the Keystone Pipeline System; on 14 August 2009 the transaction was completed. Keystone submitted that its acquisition of sole interest in the pipeline did not affect the financial risk of the Project or Keystone's ability to fully finance the capital expenditures required to place the Keystone XL Pipeline into service. The funds required to finance the Project would be obtained through a combination of internally generated cash flow, and debt and equity raised from banks and the American and Canadian capital markets.

No party raised concerns about either the proposed method of financing or on the ability of Keystone's ultimate parent company, TransCanada Corporation, to finance the construction of the applied-for facilities.

Views of the Intervenor

The Board notes that no party filed evidence contravening Keystone's assessment of Western Canada Sedimentary Basin (WCSB) supply or the USGC market. Areas of contention related chiefly to elements of Keystone's evidence dealing with transportation matters.

Keystone XL Shippers Group (KSG)

KSG stated that the best evidence of the need for the Keystone XL Pipeline lies in the contracts that the Keystone shippers have signed, and the fact that Keystone has accepted the risk of any underutilization. In addition, KSG noted that several of Keystone's shippers are among the largest crude oil producers in Canada who have invested further billions of dollars in production infrastructure as part of global production strategies. The KSG submitted that such a demonstration of shipper support to access a new market is a compelling indicator of the public interest.

Valero Marketing and Supply Company

Valero stated that it wants to have the opportunity to buy crude oil from the Canadian oil sands and believes that pipeline capacity to the USGC is required. Valero described the WCSB as a potentially plentiful source of heavy crude oil that is produced in a politically stable and friendly environment.

Valero submitted that the USGC is a strong market for crude oil from the WCSB, and that its own USGC refineries alone represent a potential market of 119 000 m³/d (750 Mb/d) of heavy crude oil. Valero submitted that it did commit to ship a meaningful volume of WCSB heavy crude oil on the Keystone XL Pipeline over several years.

Enbridge

Enbridge acknowledged the importance of providing western Canadian oil producers with sufficient transportation capacity to serve both traditional and new markets and that the USGC represented a large and attractive market for western Canadian crude oil.

Enbridge submitted, however, that the economic environment has changed dramatically since the summer of 2008, when Keystone held its open season. Forecasters have predicted a much slower rate of growth in western Canadian crude oil production and, with the major oil pipeline projects that are currently under construction, there will be ample take-away capacity from western Canada to U.S. markets for several years after 2012.

Enbridge submitted that the Keystone XL Pipeline project would create an unnecessary and unprecedented level of excess pipeline capacity between western Canada and U.S. markets. In the current circumstances, Keystone can utilize existing pipeline facilities in Canada as part of the Keystone XL project and avoid unnecessary pipeline construction. This would result in a greater benefit to Canadian oil producers, and would be in the overall Canadian public interest.

Enbridge also argued that the Keystone XL Pipeline was designed with unnecessary excess capacity relative to its contracted volumes. Enbridge expressed concern that once the Keystone XL Pipeline is in service, the Cushing Expansion facilities approved by the Board in OH-1-2008 would not be required for the stated purpose for which they were authorized.

Finally, Enbridge submitted that although the open season was not flawed, parties who had entered into and participated in the Keystone XL Pipeline open season in the summer of 2008 would not have done so today. The changed circumstances, and in particular the resulting

impact on the expected growth of crude oil production from the WCSB, would have a dramatic effect on any analysis conducted to support a new pipeline.

BP Canada Energy Company (BP)

BP argued that the Keystone XL Project was not consistent with the current realities of crude oil supply, demand and transportation markets. It said that the Keystone XL Pipeline is designed with too much capacity and is being put in place too early.

In BP's view, the Board should not assume that the Keystone shipper contracts are a reasonable reflection of current or even forecast markets, and the Board should be concerned as to whether the Keystone XL Project is now being driven by market requirements, or by contract obligations.

Imperial Oil Limited (Imperial)

Imperial stated that the Keystone XL Project should be denied in part because no new capacity is required, or will be required, for some time. For the Board to determine that the Keystone XL Pipeline is economically feasible, Keystone must demonstrate that the pipeline would cover its costs and earn a reasonable rate of return. Imperial argued that Keystone XL does not meet that test since its TSAs pay only for the capital of the Project. In order to realize any return on its investment, Keystone would have to take volumes from other Canadian cost-of-service systems, which would have a significant impact on cost-of-service shippers, such as Imperial.

Imperial stated that it fully supports building infrastructure to open new markets; however, it does not support doing so at all costs.

Nexen Inc. (Nexen)

Nexen did not dispute the desirability of the USGC market, but indicated its concern that the evidence showed that new western Canada export capacity would not be required until the 2020 timeframe.

In Nexen's view, the world has changed since the KSG executed the Keystone XL TSAs, and while the contracts may have indicated sound market fundamentals in a robust market, they may not do the same in a different market. Nexen suggested that the contracts be viewed with skepticism in their role as a market signpost.

Suncor Energy Marketing Inc. (Suncor)

Suncor supported approval of the proposed Keystone XL Pipeline project; however, it expressed concerns that the segment from Hardisty to Steele City is not required within the timeframe proposed by Keystone. Suncor submitted that the Board should approve the proposed Keystone XL Pipeline in a timeframe that allows for the Cushing to USGC portion to be completed by 2011 and the Hardisty to Steele City portion to be completed in a manner that does not result in an overcapacity issue for the whole industry.

Views of the Board

The Board must be satisfied that there will be adequate supplies of crude oil available so that the facilities can be justified over the economic life of a project.

Keystone submitted that western Canadian crude oil supply has grown significantly and although growth from the oil sands has slowed, it will continue to grow over the forecast period. The Board notes that Keystone's supply forecast is similar to those prepared by CAPP and the ERCB and was not challenged during the proceedings.

The Board recognizes the uncertainties associated with the forecasts of crude oil supply available to the Keystone XL Pipeline; however, it accepts as reasonable the crude oil supply projections submitted by Keystone. This growing supply profile is supported by Alberta's substantial oil sands reserves and western Canada's conventional light and heavy oil reserves. Together with the supply committed to the Keystone XL Pipeline, the Board is satisfied that there will be sufficient supply available.

The Board is also satisfied that there is an adequate market to absorb the volumes that will be delivered off the Keystone XL Pipeline. No party disputed that the USGC is a large, long term and strategic market for Canadian crude oil. The Board is of the view that the refining area to be supplied by the Keystone XL Pipeline holds strong potential for Canadian crude oil producers. The opening of new markets for Canadian crude oil would alleviate the economic risk associated with saturation in traditional markets.

While it was demonstrated that there may, for some time, be physical excess pipeline capacity for western Canadian crude oil exports, the Board agrees with Keystone's assessment that no excess capacity currently exists connecting western Canada and the USGC. At this time, Canadian producers can only access the large PADD III market indirectly, through the relatively small Pegasus Pipeline. The Board considered Suncor's argument that it should approve the proposed Pipeline in a time frame to allow the Cushing to USGC portion to be completed by 2011 and the Hardisty to Steele City portion to be completed in a manner that does not result in export pipeline overcapacity. However, the Board was not persuaded as Suncor did not provide the Board with evidence on the feasibility of this concept. The issue of excess pipeline capacity is further addressed in Chapter 4, Commercial Impacts.

The Board notes the perspective of some intervenors that the Keystone XL Pipeline has been designed with too much capacity relative to its contracted commitments, and in consideration of western Canada export

capacity overall. The Board is of the view, however, that prudent design must consider both the current and future requirements for transportation service over the life of a Project to achieve the objective of efficiency. The Board is satisfied that the Keystone XL Pipeline, as proposed, reflects a reasonable balance of both the current and anticipated requirements of shippers over the longer term, given the supply potential of the WCSB and the size of the USGC market.

The Board considers the existence of long-term transportation agreements to be strong evidence for the need for the Keystone XL Pipeline. There is industry support to access the USGC market through the binding agreements to ship 60 300 m³/d (380 Mb/d) of crude oil for an average of 17 years. The significant financial commitments made by shippers through the TSAs indicate to the Board that the USGC will likely prove to be a profitable long-term market for Canadian crude oil. The Board is not persuaded by the arguments of some intervenors that the contracts should be viewed with skepticism in light of changes to the economic environment that have occurred since their execution. In 2009, Keystone received reaffirmation from its committed shippers to proceed with the Keystone XL Project in the 2012 timeframe.

The Board finds the proposed method of financing to be reasonable and accepts that Keystone's ultimate parent company has the ability to finance the construction of the Project and place it into operation.

Therefore, the Board finds that the Keystone XL Pipeline is economically feasible; that the applied-for facilities are likely to be used at a reasonable level over the economic life of the Project; and that the tolls are likely to be paid.

Chapter 4

Commercial Impacts

In making a determination on impacts of a project on commercial third parties the Board considers (i) the potential impact of the pipeline on competition and on netback prices to oil producers; (ii) the potential impacts on existing pipeline infrastructure; and (iii) potential impacts on the Alberta upgrading and Canadian refining industries.

4.1 Competition and Netbacks

4.1.1 Competition

Views of Keystone

Keystone maintained that the Keystone XL Pipeline application was about competition and new market access and stated that functioning and competitive markets are in the overall public interest.

Keystone submitted that if the Board were to deny or delay the application, it would frustrate the commercial arrangements entered into between Keystone and Keystone XL shippers, effectively eliminating competition. It argued that it would also result in Keystone losing the benefits of the negotiated project it has achieved through a competitive process to provide transportation to the USGC. Keystone also advised that its shippers would be disadvantaged and potentially exposed to financial losses, despite having entered into TSAs in good faith on the basis of a fair and transparent competitive process.

Keystone stated that denial or delay of the Keystone XL application would also create the opportunity for any competitor, but particularly Enbridge, to obtain an overwhelming competitive advantage in its ongoing efforts to serve the USGC market. Keystone argued that the longer the delay, the more Enbridge's competitive position would be enhanced.

Keystone also argued that denial or delay of the Keystone XL Project would send a message that incumbents enjoy an inherent advantage over new entrants. The market signal would be that in the face of changing supply forecasts, incumbents have the right to transport incremental supply notwithstanding the existence of freely negotiated transportation arrangements by which supply is committed to an alternate system. This would create an artificial barrier to entry for new competitors.

Keystone submitted that this was not a case of insufficient supply for the pipeline, as suggested by some intervenors, but rather that if Keystone XL is approved there would be competition for supply growth in the future.

Views of the Intervenor

KSG

The KSG agreed that the Keystone XL application is about competition, access to markets, and free and open decisions about how markets are accessed, and the support provided by those seeking to pay for service to those markets.

KSG submitted that the relevant factors are competitive dynamics, because it is an application for a pipeline that (1) would compete with existing pipelines for crude volumes; (2), would allow USGC refiners to compete for Canadian crudes; and (3) is vigorously opposed by a competitor.

Valero

Valero stated that it did not make the decision to support the Keystone XL pipeline lightly; it considered commercial terms, the regulatory environment and the benefits of the Project. Valero indicated that it decided to support the Project because it offered the best overall solution for its Port Arthur refinery.

Enbridge

Enbridge stated that its proposition to utilize existing pipeline infrastructure as part of the Keystone XL Project was about public interest considerations such as promoting efficient energy infrastructure, and minimizing environmental impacts.

Enbridge submitted that its proposition was consistent with the outcome of the competition to serve the USGC. The transportation by others arrangement that it proposed also respected this competitive outcome, since Keystone would be providing service to Keystone XL shippers from Hardisty to the USGC.

Kinder Morgan

In its letter of comment, Kinder Morgan indicated that it was not opposed to the Keystone XL Project, and acknowledged that once the Keystone XL Pipeline is operational both the Trans Mountain and Express systems would compete with it for Alberta crude oil supply destined for U.S. markets. Kinder Morgan wished to inform the Board of its view, however, that approval of the Keystone XL Pipeline would pose challenges related to the coexistence of contracted and cost of service based tolls.

Kinder Morgan proposed that the NEB be open to all cost of service (COS) toll-regulated pipelines charging negotiated contract and/or market based tolls to promote proper competition and fairness in the market.

BP

BP acknowledged that customer choice is important and should be accommodated where it is reasonable to do so. It cautioned, however, that acceding to customer choice for the sake of

choice has the potential to add and shift costs among consumers without regard to long-term use, efficiency or the public interest.

Nexen

Nexen stated that it favours healthy competition between pipelines, but is opposed to excessive overbuilding because of the toll consequences.

Imperial

Imperial stated that it fully supports competition in pipeline markets; however, it does so only if that competition is fair. Imperial argued that approval of the Keystone XL Pipeline would result in an uneven playing field in the marketing of Keystone XL's uncommitted capacity. In the absence of new production, it argued that the Keystone XL Pipeline would cause offloading of crude oil volumes from existing cost of service pipeline systems, and given regulatory constraints, competition for uncommitted volumes between Keystone XL and those pipelines would be inherently unfair.

4.1.2 Netbacks

The netback price of a barrel of crude oil is calculated by taking the revenue that producers receive for that oil and subtracting all the costs associated with getting that crude oil to a market.

The Keystone Application included a supply and markets assessment prepared by PGI. The PGI assessment included an analysis of Canadian crude oil pricing related to the Keystone XL Pipeline. PGI explained that producers would benefit from the Project because it would help avoid a return to discounted heavy crude oil export prices that have occurred in the past, and help to sustain strong prices in the U.S. Midwest and Hardisty, AB markets.

PGI indicated that historical price discounts at the USGC suggest that the supply of Canadian heavy crudes has exceeded demand in traditional markets. Existing markets for Canadian heavy crude, principally PADD II, are currently oversupplied, resulting in price discounting for Canadian exports of heavy crude oil. It further stated that access to the USGC via the Keystone XL Pipeline is expected to strengthen Canadian crude oil pricing in PADD II by removing over supply.

Since 2006, the price of Cold Lake Blend has been discounted compared with the price of Mexican Maya heavy crude oil at the USGC. This price discount suggests that the supply of Canadian heavy crudes has exceeded demand in their main markets north of the USGC. PGI submitted that in 2008, the average discount for Cold Lake Blend at the USGC was approximately US\$3.24 per barrel. It indicated that by increasing market access for Canadian heavy crudes, this discount should be avoided in the future. If the Keystone XL Pipeline causes the USGC price discount to be eliminated, PGI estimated the annual revenue increase to the Canadian producing industry at US\$2.0 billion. In addition, if the Keystone XL Pipeline causes the Midwest price to rise above USGC parity, the annual revenue to Canadian producers could increase by a further US\$1.9 billion, reaching approximately US\$3.9 billion.

In April 2009, PGI completed an updated forecast projecting continued growth in crude oil supply, but at a lower rate than that previously forecast (see Chapter 3). Due to lower supply volumes, PGI submitted that the increase in revenue to Canadian heavy crude oil producers in 2013 would decrease from the earlier estimate of US\$2.0 to US\$3.9 billion to US\$1.8 to US\$3.4 billion.

PGI acknowledged that there could be pipeline costs which might offset the forecast revenue benefits. Based on a report provided by Enbridge, PGI estimated total pipeline costs to be approximately US\$1.4 billion in 2013, comprising the Keystone XL Pipeline toll paid on the contracted volumes of 60 400 m³/d (380 Mb/d) and the Enbridge projected toll increase applied across all non-contracted western Canadian oil exports. Adjusting its estimated gross benefit to producers of US\$1.8 to US\$3.4 billion, PGI calculated the net benefit to Canadian producers at US\$0.4 to US\$2.0 billion in 2013. (Table 4-1) Keystone submitted that this annual benefit should be sustained and grow with higher production for three to four years.

Table 4-1
PGI – Keystone XL Net Benefits to Canadian Crude Producers in 2013

Cost of Service Pipeline Tolls Increase	Total Costs Related to Increased Cost of Service Pipeline Tolls	Keystone XL Toll	Total Cost for XL Committed Volumes	Total Costs to Producers Related to Pipeline Tolls	Gross Benefit	Net Benefit
US\$0.65/bbl	US\$503 million	US\$6.25/bbl	US\$867 million	US\$1.37 billion	US\$1.8 to US\$3.4 billion	US\$0.4 billion to US\$2.0 billion

Views of the Intervenor

KSG

KSG submitted that new market access would alleviate the risks of saturation in traditional markets and improve netbacks for all western Canadian producers. The TSAs are the best evidence of the need for the applied-for facilities and that the benefits of USGC access outweigh the impact of increased tolls.

KSG stated that the Keystone XL pipeline would be opening a new market, thereby to maximizing crude oil netbacks and the revenues available to governments and industry to make social and economic investments. In its view, this outcome would be in the public interest.

Enbridge

Enbridge retained Muse, Stancil & Co. (Muse) to evaluate the implications of the Keystone XL Pipeline for Canadian crude oil producers. Enbridge asked Muse to evaluate the Western Canadian Crude Supply and Markets report provided by PGI on behalf of Keystone, and to conduct an independent assessment of the benefits of the Keystone XL Pipeline project to Canadian oil producers.

Muse concluded that the assessment provided by PGI significantly overstated the benefit of the Keystone XL Pipeline project to Canadian oil producers. Specifically, Muse found that:

- the ongoing expansion of the Enbridge system and the construction of the Base Keystone Pipeline would capture much of the benefit that PGI is attributing to the Keystone XL Pipeline project;
- the 2006-2008 time period selected by PGI as the basis for its benefit calculations had quite different market conditions than that expected in 2013;
- there are substantive errors in the calculation methodology employed by PGI to determine the Hardisty crude price using the U.S. Gulf Coast netback basis;
- the calculation methodology employed to determine the Hardisty crude price using a U.S. Midwest netback basis overstates the price impact; and
- PGI is using Canadian pricing theories that are incorrect.

Muse used its Crude Market Optimization Model to evaluate the expected pricing benefit of the Keystone XL Pipeline. Muse explained that it developed this model for use in a wide variety of commercial applications, including detailed forecasts of western Canadian crude prices, assessment of likely western Canadian crude consumers, and pipeline utilization studies. Using crude oil supply data from the Canadian Association of Petroleum Producers (CAPP) 2009 Growth forecast, the model predicted the flow of crude oil to particular markets and the Canadian crude prices that result from such flows.

Muse estimated that the aggregate net benefit to Canadian oil producers from the Keystone XL Pipeline would be US\$102 million in 2013, assuming that only the current committed volumes of 60 400 m³/d (380 Mb/d) were transported.

During the proceeding, Muse explained that the benefit of the Keystone XL Pipeline to Canadian oil producers of US\$102 million did not include the cost to producers of the Keystone XL Pipeline fixed toll, which amounted to about US\$562 million in 2013. Muse submitted that with this adjustment, the net benefits of the Keystone XL Pipeline in 2013 would have been about negative US\$500 million. Enbridge argued that the assessment of Muse was not challenged by Keystone.

Enbridge stated that the PGI assessment of the pricing benefit to Canadian oil producers was not credible and that the Keystone XL Application should be denied because it has not been demonstrated that its benefits would outweigh its burdens.

BP

BP stated that Keystone did not successfully establish that the Keystone XL Pipeline would deliver a net benefit to Canadian producers; or if it would, it was not as obvious or substantive as Keystone suggested.

Nexen

Nexen submitted that the pricing impacts put forth by PGI and Muse may or may not be realized. In its view, the size of that benefit and whether it would exceed the toll impact is open to question.

Imperial

Imperial stated that PGI's analysis did not permit the conclusion that the Keystone XL Project benefits outweighed its costs.

4.2 Potential Impacts on Existing Pipeline Infrastructure

Views of Enbridge and Supporting Intervenors

Enbridge stated that if the Keystone XL Pipeline were placed into service as proposed, crude oil volumes would be offloaded from its system and shipped on the Keystone XL Pipeline, resulting in increased tolls for Enbridge system shippers. Enbridge estimated that the volumetric offloading on its system would be 51 750 m³/d (326 Mb/d), based on the CAPP 2009 Growth Case supply forecast and assuming that Keystone XL transported volumes of 60 400 m³/d (380 Mb/d). Enbridge calculated that this would result in a toll increase to Enbridge system shippers in 2013 of CDN\$0.75 per barrel from Edmonton to Chicago, totaling CDN\$315 million.

Enbridge indicated that the impact would be greater if either the Base Keystone Pipeline or the Keystone XL Pipeline were to transport more than their contracted volumes. Enbridge completed a sensitivity analysis that assumed that Keystone XL was transporting its capacity of 111 100 m³/d (700 Mb/d) and determined that 96 200 m³/d (606 Mb/d) would be offloaded from the Enbridge system, resulting in a CDN\$1.60 per barrel increase in the toll from Edmonton to Chicago. The total impact to Enbridge shippers in this case would increase from CDN\$315 million to about CDN\$515 million.

In summary, Enbridge stated that the Keystone XL Pipeline would offload between 60 300 m³/d (380 Mb/d) and 111 100 m³/d (700 Mb/d) from all existing Canadian pipelines, and would offload between 51 750 m³/d (326 Mb/d) and 96 200 m³/d (606 Mb/d) from the Enbridge system.

Enbridge acknowledged that the WCSB is a growing producing region and that it is reasonable to expect that spare pipeline capacity would be reduced over time. Accordingly, Enbridge estimated that the toll impact on its system would likely decrease somewhat over subsequent years. It indicated that the CDN\$0.75 toll impact would decline potentially by 10 to 20 cents per barrel over five years.

The Gretna Option

Enbridge stated that in March 2009, CAPP expressed concern that previous western Canadian crude oil supply projections were no longer realistic and asked it to consider whether there were opportunities to utilize existing pipeline capacity as part of the Keystone XL Pipeline project, in order to achieve greater economic efficiency and improved benefits for all crude oil shippers. Enbridge stated that CAPP presented it with the Gretna Option, which would involve:

- use of the Enbridge pipeline system from Hardisty, AB, to Gretna, MB, to transport crude oil nominated to the Keystone XL Pipeline;
- construction of an interconnection between the Enbridge pipeline system and the Keystone XL Pipeline in the Gretna area; and
- construction by Keystone of the Keystone XL Pipeline south from the Gretna area to Cushing and the USGC.

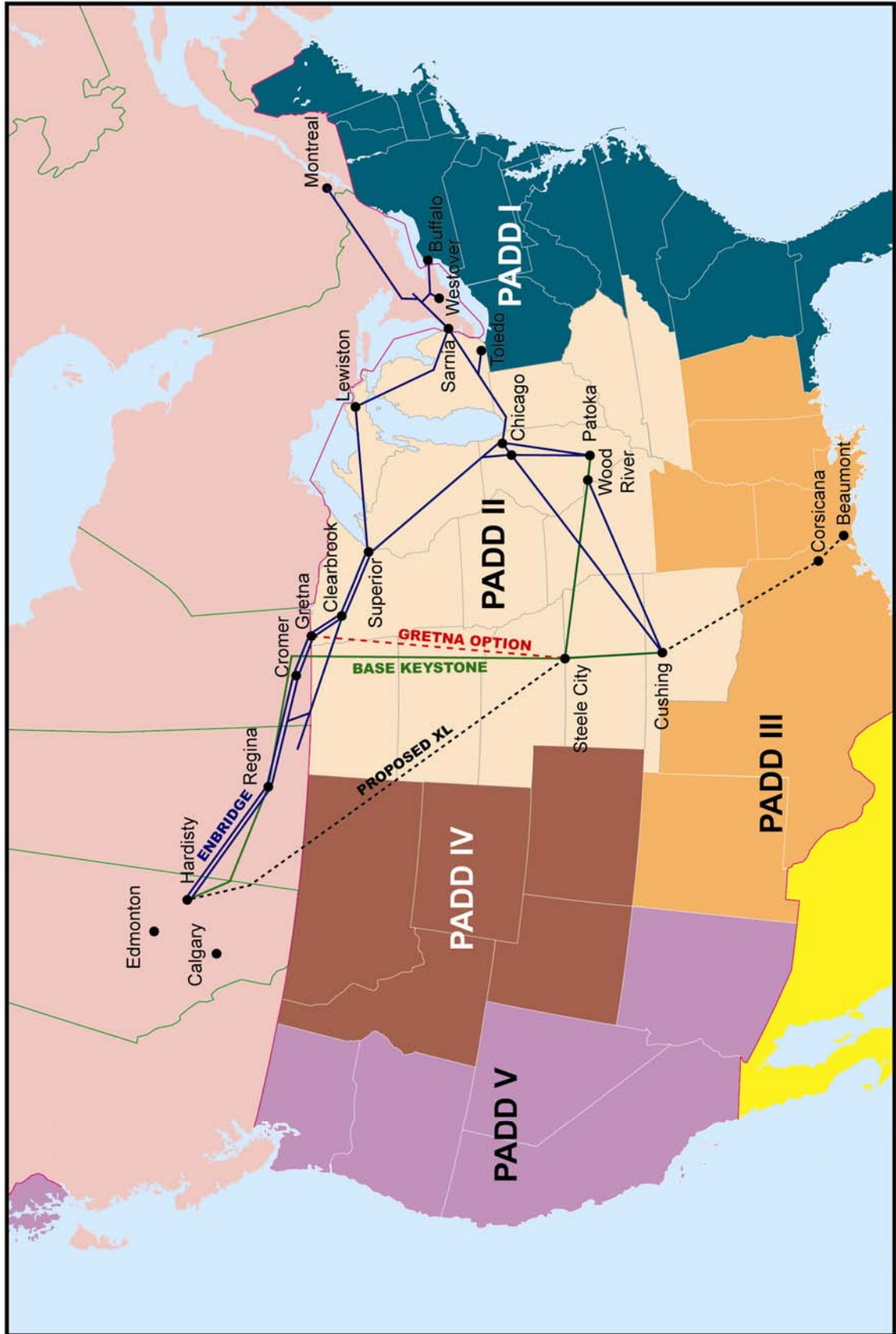
Enbridge indicated that it was willing to address potential development options with CAPP. With regard to the Gretna Option, Enbridge advised CAPP that significant savings would be achievable in comparison to the proposed configuration of the Keystone XL Pipeline due to the lower capital costs for the Keystone XL Pipeline project and better utilization of the Enbridge system. Specifically, with the Gretna Option:

- there would be a capital cost saving of approximately US\$2 billion if the Keystone XL Pipeline were to be built from the Gretna area to the USGC rather than from Hardisty to the USGC;
- there would be about a CDN\$0.35 per barrel toll saving on the Enbridge system, which would benefit all Canadian oil producers due to the positive impact on netbacks;
- there would be a significant working capital saving for shippers, because the linefill requirement for the Keystone XL Pipeline in Canada would be lower by approximately 2 million barrels;
- new Canadian pipeline construction could be better timed to meet expected western Canadian supply growth; and
- construction, environmental and permitting challenges would be reduced by making use of existing pipeline facilities in Canada.

Enbridge stated that it was committed to making the Gretna Option work and was putting it forward because it believed that it would produce a better result for industry by achieving the benefits of USGC access, but with lower costs. In its view, the Gretna Option would produce a much better result from a Canadian public interest perspective.

Enbridge indicated that it was open to having discussions with Keystone about the Gretna Option; however, it was of the view that for the Gretna Option to proceed, the Board must deny the Keystone XL Application. Enbridge submitted that if the application were approved, Keystone would lack the necessary financial motivation.

Figure 4-1
The Gretna Option



BP

BP indicated that it is a significant shipper on the Enbridge system.

BP was of the view that the Keystone XL proposal would exacerbate the negative effects of excess takeaway capacity from the WCSB and impose unreasonable costs on common carrier shippers. BP submitted that if no alternate approach could be established that would find a more efficient and effective way to serve the USGC, then the Board should deny the Keystone XL Application.

BP stated that it did not know if it supported the Gretna Option, but believed that the potential for achieving broader based benefits and minimizing the negative impacts was clearly worth exploring.

BP suggested that the NEB should take some positive steps to encourage discussions between Enbridge and Keystone to assess the viability of the Gretna Option; otherwise those discussions would not occur. It suggested that the Board withhold its decision until discussions have been held. BP submitted that this approach would facilitate the opportunity for parties to seek, and for the Board to ensure, that a more effective and efficient solution in the public interest is not ignored.

Imperial

Imperial argued that Keystone XL capacity would be used to offload from cost of service pipelines and would result in significantly increased tolls to their continuing shippers. As a major shipper on the Enbridge system, Imperial said it would be materially impacted if Keystone XL were approved.

Imperial argued that the Keystone XL Application should be denied because it ignores the impact on cost of service shippers and focuses solely on Keystone's own commercial interests.

Imperial stated that it supports new market access for Canadian crude oil, and believes that the Canadian public interest is best served in considering such market access by promoting cost-effective, efficient infrastructure prior to concluding that a new pipeline is required.

Imperial stated that Keystone did not undertake the necessary analysis of alternatives using existing Canadian infrastructure. Imperial's view was that in that absence of this analysis the Board would be unable to evaluate whether the Keystone XL Pipeline is in the Canadian public interest. Imperial submitted that the Keystone XL Pipeline will increase surplus capacity in Canada to the detriment of Canadian shippers and that until the Board is convinced that Keystone has looked at all possible alternatives to get WCSB product to the USGC and that the Canadian public interest is best served by proceeding with the Keystone XL Pipeline, the Board should not approve the Application.

Nexen

Nexen stated that it is opposed to excessive overbuilding of pipelines because of the toll consequences and concluded that it is not in the public interest to incur greater cost than necessary to access the USGC market.

Nexen submitted that the assessment of whether Keystone XL is in the interest of the producer community and the Canadian public must be based on whether it is better or worse than the Gretna Option. It argued that the Gretna Option achieves all of the stated benefits of the Keystone XL proposal, but without the associated costs.

Nexen asked that the NEB give both pipeline parties a clear signal and the proper encouragement to reach an agreement on the Gretna Option. In this regard, Nexen suggested that the Board delay the ruling on the Application until Keystone has demonstrated that it has made reasonable commercial efforts to reach an arrangement. It submitted that if a decision must be made to either approve or deny the Application, it reluctantly recommended a denial, in the expectation that all parties, in particular Keystone, would then have the best incentive to compromise with the Gretna Option.

Views of Keystone and Supporting Intervenors

Keystone stated that potential future underutilization of the Enbridge system should be managed directly by Enbridge and its stakeholders. Further, it stated that it would not be the cause of potential future underutilization on the Enbridge system. Keystone argued that Enbridge wishes to use the Keystone XL Project as a vehicle to manage the consequences of potential underutilization on its system. It stated that Enbridge should have known since 2008 that the supply associated with the long term contracts on Keystone XL would not be available to be transported on its system.

Keystone stated that the Keystone XL Pipeline is underpinned by long-term contracts and would for the first time connect supply directly with the USGC, a large, highly desirable, and virtually untapped market. Keystone submitted that this connection would provide pricing benefits to producers and other operational attributes that are attractive to the market and are not otherwise available via competing transportation systems.

Keystone submitted that it is not the applicant's responsibility to conduct a broad assessment of the potential effects of a specific project on a wide variety of potential interests. It argued that it does not know what potential volumetric impacts might be associated with the Keystone XL Pipeline in respect of the Enbridge system.

Keystone noted that neither CAPP nor any Enbridge shipper has filed evidence expressing concern that the approval of the Keystone XL Pipeline would have an adverse impact on the producing industry generally or individual shippers specifically.

The Gretna Option

Keystone submitted that it would be prepared to explore options for providing transportation service, including the use of existing capacity, where those options are raised as proposals in a timely and legitimate fashion, are viable and reasonable, and meet customer requirements and Keystone's commercial needs. It stated that in order to constitute a viable and reasonable alternative to the Keystone XL Project, any option would have to deliver the same benefits to Keystone and its shippers within the same timeframe and on the same terms and conditions as the existing contractual arrangement, without introducing additional risk.

Keystone submitted that it would be willing to consider formal proposals that deal with its key threshold issues, but it was not prepared to respond to concepts or otherwise develop or negotiate concepts in a regulatory proceeding.

Keystone's stated its key threshold issues were as follows:

- Delayed in-service timing;
- Negative impact on quality;
- Increased transit time;
- Capacity constraints;
- Economic benefit;
- Shipper choice;
- Growth opportunities;
- Higher ultimate capital cost; and
- Higher operating cost.

Keystone stated that Enbridge had never presented its concept to Keystone and in its view, it has received very little review or scrutiny from CAPP or industry. Keystone indicated that given the infancy of the concept, the numerous stakeholders involved, and the complexity of structuring multi-billion dollar deals, it believed that such discussions could be very lengthy and may well ultimately not reach a successful conclusion.

In Keystone's view, the Gretna Option is not developed and has serious issues associated with its viability. Keystone indicated that the temporary nature of the Gretna Option was a major concern, and could result in the U.S. portion of the Keystone XL Pipeline becoming a \$5 billion stranded asset, forcing Keystone to build again in Canada to effect deliveries to the U.S.

Keystone stated that any delay in a decision on the Application in order to provide time to consider the Gretna Option would have the same effect as a denial and the Keystone XL Project would not proceed.

In final argument, Keystone questioned why Enbridge would not offer to sell the assets to Keystone if it were truly concerned about mitigating the alleged negative impacts of Keystone XL on its shippers.

Valero

Valero acknowledged that with the Keystone XL Pipeline in service, there may be significant excess WCSB export pipeline capacity. From a long term strategic point of view, however, given the size of the WCSB resource base and the USGC market, this would not be inconsistent with the Board's goal of efficient infrastructure and markets.

Valero indicated that one possible outcome of the Keystone XL Pipeline could be an increase in the tolls on some pipeline systems. It indicated, however, that some pipeline systems seeking to increase throughput in an overcapacity situation would seek to lower tolls in order to attract more shippers and additional volumes.

Valero indicated that if the Board were to approve Keystone XL, it would not object to Keystone and Enbridge discussing the viability of the Gretna Option, provided that any potential commercial solution to incorporate the Gretna Option resulted in lower costs for Keystone XL shippers, included commercial terms at least as favourable as those set forth in the Keystone XL TSAs, did not degrade the level of transportation service or firm capacity that Keystone XL is prepared to offer its shippers, or delay the in-service date for the Keystone XL Project.

Valero stated that it is not a shipper on the Enbridge or Trans Mountain pipeline systems.

KSG

KSG was of the view that the Keystone XL Project will only result in increased tolls on the Enbridge system temporarily, as a result of the lumpy nature of new pipeline projects.

In KSG's view, the Gretna Option should not distract the Board from approving the Keystone XL Pipeline. KSG viewed the Gretna Option as a stalking horse for Enbridge's failed USGC projects and not a serious proposition. Even if it were a serious proposition, KSG argued that the risk of delayed access to the USGC and the associated risk of price discounting would make it non-viable.

4.3 Impacts on the Upgrading and Refining Industry in Canada

Views of the Intervenors

Alberta Federation of Labour

The Alberta Federation of Labour (AFL) expressed the view that shipping unprocessed bitumen to the U.S. is not in the public interest.

In support of its position, the AFL submitted its report entitled "*Lost Down a Pipeline*". It concluded that billions of dollars are being spent by major energy companies to build, retool, or expand at least 10 USGC refineries to upgrade and refine raw bitumen from the Alberta oil sands. The AFL characterized major export pipeline projects as bitumen super-highways that act as conduits for the export of Alberta's raw resources and thousands of high-paying jobs. In its view, these Canadian jobs would provide the opportunity for industry and workers to move up the value ladder, thereby promoting diversification of Alberta's economy.

The AFL also stated that approval of the Keystone XL Pipeline Application would increase the price of bitumen purchased by Alberta upgraders and refiners.

The Communications, Energy & Paperworkers Union of Canada (CEP)

The CEP raised concerns about the potential adverse impacts of recently NEB-approved pipeline projects on the economic development of the oil and gas industry, and on Canadian energy security. In its view, it is incumbent upon the Applicant to provide evidence that would allow the Board to make an informed judgment about the potential impact that the Keystone XL Pipeline project would have on present and future investments in the upgrading and refining of oil sands and other Canadian oil resources, and on the question of Canadian energy security. The CEP submitted that Keystone did neither.

In the CEP's view, export pipeline capacity has a strong influence on domestic investment in upgrader facilities. It argued that if new pipelines decrease the spread between synthetic crude oil and bitumen by providing ready access to U.S. upgraders, important incentives for value-added processing in Canada will be undermined. The CEP noted that absent credible and thorough analysis, there is no way to determine what influence approving new pipeline infrastructure would have on investment decisions concerning Canada value-added processing.

The CEP submitted that the wholesale export of raw materials and natural resources from Canada is not in the public interest. The CEP urged the Board to send the industry a clear message that it would not sanction large scale export pipeline projects unless it could be demonstrated that such projects would not threaten investments in value-added processing of Canadian resources.

Enbridge

In Enbridge's view, the potential impact of the Keystone XL Pipeline on domestic refiners of heavy oil should be taken into account when assessing the net benefits of the Project to the Canadian oil industry.

The Muse study prepared on behalf of Enbridge indicated that roughly 25 per cent of western Canadian crude oil production flows to a Canadian refiner. As a result, Muse advised that the impact to the Canadian refiners should be included as part of an assessment to determine net benefits to the Canadian crude oil industry overall. Muse calculated that the net benefit of Keystone XL drops by about 27 per cent, or by about US\$28 million per year, when costs to Canadian refiners are taken into account.

Based on the PGI analysis, Enbridge calculated that a price increase of US\$6.55 a barrel on 39 800 m³/d (251,000 b/d) of Canadian heavy oil refining capacity increase the supply cost to Ontario and western Canadian refineries by US\$600 million in 2013. In Enbridge's opinion, this cost must be reflected in the assessment of the benefits and burdens of Keystone XL to the overall Canadian industry.

Views of Keystone

In Keystone's view, the Keystone XL Pipeline would facilitate upgrading in Alberta by providing transportation to market for a wide variety of crude oils. Keystone explained that if shippers choose to upgrade in Alberta, they have the ability to ship upgraded crude oil on Keystone XL. Keystone also noted that, if required, the design could be modified to accommodate shipment of refined products. Keystone stated it was well established that the recent delays and cancellations of proposed upgrader projects were mainly due to high development costs in Alberta and the reduced pricing differential between heavy and light crude oil. Keystone submitted that there is no established connection between those delays and crude oil export capacity from Alberta.

Keystone noted that no refiner or upgrader took the position that the Keystone XL Pipeline should not be built because it would negatively affect either their ability to obtain supply, or the price that they would be required to pay for that supply.

Views of the Board

Competition and Netbacks

The Board notes that most of the parties including Keystone, Enbridge, BP, Imperial Oil, Nexen, Kinder Morgan, and the Keystone Shippers Group expressed views in support of competition and the importance of shipper choice. As expressed in previous Board decisions, in general, the public interest is served by allowing competitive forces to work, except where there are costs that outweigh the benefits.

The Board is of the view that the Keystone XL Pipeline would be an innovative complement to the existing transportation infrastructure and deliver economic benefits through enhanced competition and increased shipper choice. No party disputed that the USGC is a large, long term and strategic market for western Canadian crude oil. Keystone XL shippers have indicated that they are seeking competitive alternatives, and by providing access to a new market, Keystone XL would be expanding shipper choice. The Board places considerable weight on the fact that Keystone XL shippers have made a market decision to enter into long-term shipping arrangements negotiated through a transparent competitive process.

New pipelines connecting producing regions with consuming regions change market dynamics in ways that cannot easily be predicted. It is difficult to determine with certainty the impact that a major project such as the Keystone XL Pipeline may have on netback prices once it is placed into service. The Board is of the view that in the short term it is reasonable to expect a period of adjustment, which could potentially include a period of lower netbacks to producers. Over the longer term, however, the Board is satisfied that the Project will help ensure that

adequate capacity exists to connect growing WCSB supply to attractive markets, and in this way help ensure that all producers realize netbacks that reflect the full market value for their production. Canadian crude oil netbacks provide revenues to governments and to industry to make social and economic investments. In the Board's view, these investments benefit all Canadians.

Potential Impacts on Existing Pipeline Infrastructure

In this proceeding, the Board heard a great deal of evidence about the potential impacts Keystone XL could have on existing pipeline infrastructure and the Canadian oil industry. In particular, Enbridge and some of its shippers urged the Board to deny or delay the approval of Keystone XL because of the burden the Project would place on other pipelines and their shippers.

The Board recognizes that existing pipelines may experience some degree of offloading for a period of time, and shippers on these systems could potentially incur higher tolls as a result. The Board had no cogent evidence before it, however, demonstrating that these potential costs would be unmanageable by the sophisticated industry parties. Moreover, the Board is of the view that all western Canadian producers are likely to benefit from the Keystone XL Pipeline over the longer term, through broader market access, greater customer choice and efficiencies gained through competition among pipelines.

When evaluating the need for new infrastructure, the Board considers the capability of existing infrastructure to meet current and future market requirements. The evidence indicates that should the Keystone XL project proceed, there may for some time be physical excess pipeline capacity for western Canadian crude oil exports. There was, however, insufficient evidence before the Board to demonstrate that existing infrastructure could practically be incorporated into the Keystone XL Project to achieve timely USGC access. Moreover, no party disputed that the Alberta oil sands are a substantial resource base capable of delivering long term, significant supply growth. In this connection, the Board is of the view that western Canada pipeline utilization overall is likely to increase over time.

The Board has considered the evidence regarding the proposed Gretna Option, which was introduced by Enbridge. An arrangement such as the Gretna Option would be highly complex and would require extensive negotiations amongst numerous parties. It was clear from the evidence that the Gretna Option is not developed to the point where it could be considered as approaching commercial reality. The Board is not persuaded by the argument that it should find that Keystone XL is not in the public interest because there might possibly be other commercial arrangements that could meet the need identified by the Applicant. A

project that meets the test under section 52 of the NEB Act should not be denied on the basis that there might be other potential options that could be developed in the future.

The Board is of the view that had the parties been of a similar mind they would have made stronger efforts on their own to explore potential solutions to minimize the costs associated with accessing the USGC market. Opportunities for the parties in this regard may still exist. The Board however does not agree with those intervenors who submitted that it should delay its decision or deny the Keystone XL Application so as to encourage the parties to pursue such solutions. The Board is of the view that to do so would unnecessarily impede competition and the operation of the market and would not be in the public interest.

Impacts on the Refining and Upgrading Industry in Canada

The Board benefitted from the perspectives of the AFL expressed throughout the proceeding and the CEP as submitted through final argument. As expressed in the OH-1-2007 and OH-1-2008 Reasons for Decisions, the Board is informed by the positions of industry parties as well as government expressions of current economic and energy policy. The Board's public interest determination must balance of the many competing political, economic and social interests.

In final argument, the CEP and AFL expressed concern that shipping raw bitumen by pipeline to the U.S. has an impact on domestic investment in upgraders and refineries in Alberta and Canada. The Board accepts these perspectives as valid public interest considerations. Based on the evidence, however, the Board has not been convinced that development of pipeline infrastructure deters investment in upgraders and refineries in Canada. The Board also believes that given the fact the Keystone XL would have the ability to transport both heavy and light crude oil and potentially with modifications, refined petroleum products that the market would properly decide what type of commodity is transported on the pipeline. In this regard, the Board concludes that it is in the public interest to allow Alberta oil exports to link directly with the USGC.

The Board notes that no refiners or upgraders expressed opposition to the Application on the basis that it would undermine their business in Canada. The Board notes that the Alberta Department of Energy was active in the hearing, but did not present final argument.

Commercial Impacts and the Public Interest

The economic benefits of the Keystone XL Pipeline Project are derived mainly from increased competition and additional transportation options for shippers. The economic burdens of the Project concern mainly the

costs to commercial third parties. In balancing these competing considerations, the Board finds that the economic benefits of the Keystone Pipeline Project will likely outweigh the costs and therefore, by this measure, the Project is in the public interest.

Chapter 5

Tolls and Tariffs

Keystone applied for approval of the proposed toll methodology pursuant to Part IV of the NEB Act. In assessing a proposed methodology, the Board considers whether the resulting tolls would be just and reasonable, and whether under substantially similar circumstances and conditions with respect to all traffic of the same description carried over the same route, the tolls would be charged equally to all persons at the same rate. The Board also must be satisfied that the toll methodology would not result in any unjust discrimination in tolls, service or facilities. In order to make these determinations, the Board considers all relevant factors specific to each application.

Furthermore, and specifically for an oil pipeline, the Board must be satisfied that the pipeline would receive, transport and deliver all oil offered to it for transmission. This requirement is usually referred to as the common carrier obligation where an oil pipeline is required to offer service to any party wishing to ship oil on its pipeline.

5.1 Open Season

Keystone indicated that following the initial development of Base Keystone, prospective shippers, including producers, marketers and refiners, expressed interest in expanding pipeline transportation services beyond the U.S. Petroleum Administration for Defense District (PADD) II markets into PADD III. On 16 July, 2008, TransCanada Corporation announced Keystone's plans to expand the Base Keystone system to provide additional capacity to the USGC by 2012. An open season for transportation service to the USGC took place between 16 July and 4 September, 2008.

As a result of the open season, Keystone received shipping commitments on the Keystone XL Pipeline by way of executed TSAs totaling 60 400 m³/d (380,000 b/d) which have an average term of 17 years. Seven TSAs were executed to support the Canadian portion of the Keystone XL Pipeline which would have a capacity of 111 300 m³/d (700,000 b/d).

Keystone submitted that the TSAs would provide committed shippers with unapportioned access on the Keystone XL Pipeline for capacity up to their contract volumes, in recognition of the significant financial support those TSAs provide to the Keystone XL Pipeline. Other key elements of the TSAs, according to Keystone, include a negotiated toll that would be fixed for the term of the contract, a variable toll that would recover operating costs in Canada and a level of capital cost risk sharing.

As part of its application, Keystone filed the pro forma TSA and Tariff for Keystone XL in Canada. Following an information request by the Board and in accordance with confidentiality order MO-13-2009, Keystone also filed the following documents:

- Executed TSAs for Keystone XL in Canada and the U.S. and pro forma TSA for Keystone XL in the U.S.

- Executed TSAs for the Cushing expansion in Canada and the Cushing extension in the U.S. and pro forma TSA for the Cushing extension
- Executed TSAs for Base Keystone in Canada and the U.S. and pro forma TSA for Base Keystone in the U.S.
- Pro forma Tariffs for Keystone XL in the U.S., the Cushing extension and Base Keystone in the U.S.

Keystone included in the OH-1-2009 record the Canadian Base Keystone and Cushing expansion pro forma TSAs and Tariffs. These two documents were not subject to the confidentiality order since they were already available in the public domain.

Views of the Parties

Valero Marketing and Supply Company (VMSC)

VMSC submitted that during 2007 and 2008, it had spent approximately 18 months considering various proposals to transport crude oil from the WCSB to the USGC via pipeline. In doing so, VMSC considered the potential tolls to be paid, the terms of the proposed TSAs, linefill requirements, transit time, product quality, access to capacity and the proposed in-service date for the pipeline. Given all of these considerations, VMSC believed that the Keystone XL Pipeline offered the most reasonable TSA terms, which made the Keystone XL Pipeline the best option for VMSC to transport crude oil from the WCSB to the USGC. Accordingly, VMSC submitted that it executed a TSA with Keystone and committed to ship a meaningful volume of WCSB heavy crude oil on Keystone XL over multiple years.

Enbridge

Enbridge was of the view that the open season process carried out by Keystone XL was not flawed.

5.2 Uncommitted Capacity and Common Carrier Status

Keystone submitted that a portion of the Keystone XL Pipeline capacity would be reserved for uncommitted volumes to accommodate shippers that did not sign TSAs. Keystone set aside 7 200 m³/d (45,000 b/d), approximately 6 percent of the Keystone XL Pipeline capacity in Canada, by not contracting this capacity on a long-term basis. Keystone noted that this volume would represent the same share of total capacity as was approved by the NEB for the Keystone Pipeline and the Cushing Expansion projects. Keystone indicated that taken together with the minimum uncommitted reservation on Base Keystone of 5 600 m³/d (35,000 b/d), the total minimum uncommitted reservation on the Keystone system would be 12 800 m³/d (80,000 b/d), approximately 6 percent of the capacity of the Keystone system. Keystone was of the view that this level of reservation was appropriate.

Keystone indicated that the reservation for uncommitted shipments on the Keystone system was in recognition of Keystone's status as a common carrier. Keystone offered the view that the ability to ship on an uncommitted basis on the Keystone system would provide Canadian producers with flexibility to respond to market conditions in either PADD II or PADD III and

create opportunities for Canadian producers to develop a broader range of U.S. customers and market opportunities.

During the course of the oral portion of the hearing, the Board sought comments from the parties on a proposed requirement pursuant to Part IV of the NEB Act which would require Keystone to reserve 20 percent of the total capacity of the combined Base Keystone and Keystone XL pipelines for uncommitted volumes. Given that Keystone's view was that its open season was appropriate and that, according to Keystone, no party to the proceeding had indicated an intention to ship uncommitted volumes, Keystone indicated that the proposed 6 percent was reasonable and sufficient to provide benefits to producers. Keystone also stated that a 20 percent reservation would appear to be unprecedented. Keystone contended that a 20 percent reservation was required by the Board only in the case of Line 9¹ where the full capacity of the pipeline was contracted, where deficiencies were found with the open season and where an intervenor specifically requested the Board to direct that uncommitted capacity be made available.

Keystone stated that a 20 percent reserve on the Base Keystone system could be achieved operationally but would be unnecessary since there would be sufficient pipeline infrastructure into PADD II from the WCSB. Keystone also indicated that a 20 percent reservation could not be accommodated in all circumstances while meeting contractual obligations on the Keystone XL Pipeline. This could also lead to disproportionately apportioned nominations creating, in Keystone's view, concerns about equitable treatment for all uncommitted shippers.

Finally, Keystone submitted that it was at risk for throughput which means that the greater the reservation of uncommitted capacity, the less flexibility Keystone would have to manage the underutilization risk. In the end, Keystone's position was that a 10 per cent reservation could be accommodated.

Keystone was of the view that it had provided all the requisite evidence related to its common carrier requirement and that the Board had all it required to issue a determination pursuant to Part III of the NEB Act.

Views of the Parties

VMSC

Based on the NEB's OH-1-2007 and OH-1-2008 Decisions where approximately 6 percent of total capacity was reserved for uncommitted shippers, VMSC believed that its committed volumes on Keystone XL would not be apportioned out of the Canadian segment of Keystone XL in order to accommodate uncommitted shippers who had decided not to make financial commitments during the open season. Given that financial commitments by shippers like VMSC were necessary to ensure that Keystone XL would be built, VMSC believed that reserving capacity for committed shippers on the Canadian portion of Keystone XL would be reasonable. VMSC argued that this would be fully consistent with the Board's prior findings in OH-1-2007 where it noted that unapportioned access accorded to committed shippers would not result in unjust discrimination.

1 OH-2-97 Reasons for Decision dated December 1997, Chapter 7, page 53

According to VMSC, the risk of apportionment would go up in the U.S. if the Board were to require Keystone to reserve more than 6 percent for uncommitted capacity. In VMSC's view, unapportioned access on the Canadian portion would give shippers some assurance that as long as there were no receipt points in the U.S., Canadian apportionment rules would continue to protect committed shippers. VMSC concluded that if it would not be problematic from Keystone's perspective to reserve 10 percent of its capacity for spot shipments while still being able to honour its contractual obligations with committed shippers, then such a level of reserved capacity would not be problematic for VMSC.

Enbridge

Enbridge indicated that Keystone should be required to have reasonable regard for the capacity requirements of uncommitted shippers.

According to Enbridge, it would be physically possible for Keystone XL to reserve 20 percent of its capacity for uncommitted volumes and still be able to meet its contractual obligations to Cushing and the USGC. In Enbridge's view, even if more volumes were nominated to Cushing and the USGC than could physically be transported on the Keystone XL Pipeline, apportionment could be possible and this would be entirely consistent with the U.S. TSAs since Keystone would not have an obligation under these TSAs to provide unapportioned access to the USGC or any other destination.

5.3 Tolls

Keystone sought approval for a tolling methodology that differed from the traditional cost-of-service model indicating that the toll design was market-based and had been negotiated by sophisticated parties. Keystone proposed to charge tolls for two types of service: 1) committed service which would be supported by long term TSAs and for which committed tolls would be charged, and 2) uncommitted service which would not be supported by TSAs and for which uncommitted tolls would be charged.

5.3.1 Committed Tolls

Keystone submitted that its committed tolls would have a fixed and a variable component. The fixed component, which was designed to recover invested capital, was negotiated and had been levelized and fixed for the term of the TSA. Levelizing the toll was intended to provide committed shippers with toll predictability and stability over the term of their contract. Keystone offered contracts for 10, 15 and 20 year terms and the fixed component of the toll decreased as the length of term increased. The toll differentiation between terms was structured to recognize the additional financial commitment provided by longer term TSAs.

According to Keystone, Base Keystone committed shippers would face no change in the fixed component of their toll since the capital costs of the Keystone XL Pipeline would be borne by Keystone XL shippers alone.

The variable component of the tolls would be treated the same for Keystone XL shippers and Base Keystone shippers and would recover the operations, maintenance and administrative

expenses of the integrated Keystone system. These costs would be allocated to shippers each month on a barrel mile basis to volumes shipped.

Keystone notified the Base Keystone shippers that the Keystone system would continue to operate on an integrated basis once Keystone XL was in service. Those shippers requested clarification on the anticipated impact to the variable toll before and after the Keystone XL Pipeline would be in operation. In May 2008, Keystone provided Base Keystone shippers with customer-confidential information in response to that request. No shipper requested further information or follow-up on the issue.

Keystone submitted that the variable toll for transporting light crude would be 70 percent of that for heavy crude oil. There had been discussion during the proceeding regarding this proposed toll differential between heavy oil volumes and light oil volumes and the extent to which this differential was appropriately reflected in the proposed fixed and variable toll components.

In that regard, Keystone indicated that capital costs were a reflection of the design of the pipeline which would benefit both light and heavy oil shippers. The Keystone XL Pipeline would get products to market faster and create economies of scale by being capable of shipping a wide range of products (light and heavy oil) while providing minimum quality degradation. Although Keystone indicated that the flow rate could be 20 – 25 per cent higher if only light crude oil moved on the Keystone XL Pipeline, it did not follow that the associated capital costs would be 20 to 25 per cent lower. In fact, Keystone contended that there would be very little capital cost difference between a heavy and light-only design. As a result, Keystone submitted that the capital costs of the Project were appropriately reflected in the fixed component of the toll which would be the same for both light and heavy shippers.

Keystone was of the view that the proposed light-heavy variable toll differentiation appropriately reflected the cost difference between transporting heavy and light crude oil resulting from the lower power requirements for shipping light oil.

According to Keystone, since the toll design was market-based and negotiated with sophisticated parties who were likely to transport both heavy and light crudes over the term of their contracts, the applied-for toll design was reasonable. This would also be, in Keystone's view, good evidence that there would be no cross-subsidy between light and heavy oil shippers built into the toll design.

Keystone was of the view that the differential between light and heavy pipeline tolls would be unlikely to affect market decisions on development decisions for upgraders. The main drivers of those types of investment decisions would be the heavy-light differential² and capital costs environment. Keystone stated that its position was supported by the fact that recent cancellations and delays of upgraders had taken place in the context of existing crude oil export pipeline toll structures which reflected a greater heavy/light toll differential than that proposed by Keystone.

Keystone submitted that undertaking a study with a view to potentially making changes to the toll design would interfere with a negotiated, market-based commercial arrangement and a toll

2 The "heavy-light differential" is the price difference between light and heavy oil (or the price difference between synthetic crude oil and bitumen).

structure that had been consistently and successfully negotiated through the various Keystone project phases. Keystone was of the view that a toll design study would be unnecessary and not useful as it could compromise the existing contracts Keystone has with its shippers for the Keystone XL Pipeline.

5.3.2 Uncommitted Tolls

Keystone submitted that uncommitted capacity would be available to provide transportation service on a monthly basis for both committed and uncommitted shippers. The maximum uncommitted toll would be the combined fixed and variable ten-year committed toll plus a premium of 20 per cent. Keystone contended that the uncommitted toll methodology reflected the substantially different circumstances of the shippers who made long term financial commitments while keeping the toll at a competitive level in order to encourage shipments and manage underutilization risk.

Keystone indicated that, in order to remain competitive, it may at times be required to offer uncommitted capacity at a toll less than the maximum uncommitted toll. In the event market conditions were such that the uncommitted toll appeared to be uncompetitive, Keystone stated that it would make the appropriate toll filing with the Board at that time to reduce the toll or to seek approval for a mechanism which would allow discounting from the maximum toll.

Views of the Parties

Keystone XL Shippers Group (KSG)

KSG submitted that it believed the applied-for facilities should be approved and were supportive of Keystone's application.

VMSC

VMSC indicated that Keystone's proposed committed rate structure for Keystone XL was reasonable for a newly constructed pipeline system of this magnitude.

Alberta Federation of Labour

AFL stated that the toll structure understates the true cost difference between transporting heavy and light crude. It argued that Keystone's proposed toll reflects power use (via variable toll component), but not differences in power capacity or actual pipeline capacity (which would result in a different fixed toll component). Consequently, AFL was of the view that this could result in a cross-subsidy from light oil shippers to heavy oil shippers.

As submitted by AFL, failing to properly reflect the actual and complete costs to transport different types of crudes diluted the relative heavy-light differential in Alberta compared to the USGC. AFL argued that this differential is an important price signal in terms of the desirability and feasibility of upgrading investments in Alberta. According to AFL, the higher the Alberta differential compared to the USGC differential, the greater incentive there would be to upgrade and/or refine in Alberta as upgraders and refiners would have access to more affordable

feedstock. AFL argued that moving these processes outside the country would result in the loss of thousands of high-paying jobs, technical innovations and economic diversification.

AFL indicated that in a competitive market, prices should be based on costs, and the role of the regulator in setting tolls is to emulate market prices. Therefore, AFL contended that the NEB should ensure that tolls are based on the long-run average cost of providing service, thereby preventing the pipeline from exercising the market power it may otherwise have.

AFL asked the NEB to require Keystone to undertake a detailed study that would determine the actual cost differences for transporting different qualities of crudes. AFL stated that such a study would not result in any change if costs were found to be adequately reflected through the proposed negotiated tolls. Conversely, should the study reveal that costs were not adequately reflected in the proposed toll, this would be a sign of market distortion which would need to be corrected.

AFL was of the view that it would not be in the public interest for a distorted toll to be approved and that the Keystone application should be denied.

5.4 Transportation Tariff

Keystone asked for approval of the pro forma transportation tariff (Tariff) pursuant to Part IV of the NEB Act. Keystone acknowledged that there was some lack of clarity in regard to the allocation policy of unapportioned capacity resulting in the business intent not being fully reflected in the Tariff. Keystone submitted that the business intent of the Keystone system was that once Keystone XL was in service, shippers with a Cushing, Oklahoma or a USGC contract delivery point would receive unapportioned access in Canada only to Monchy, Saskatchewan (via the Keystone XL Pipeline). Furthermore, shippers with a Wood River or Patoka contract delivery point would receive unapportioned access to Haskett, MB (via the Base Keystone pipeline), irrespective of whether or not Keystone XL is in service. This business intent is in contrast to the applied-for Tariff, whereby unapportioned access could be offered to shippers with a Cushing or a Gulf Coast contract delivery point on Base Keystone and to shippers with a Wood River or Patoka contract delivery point on the Keystone XL Pipeline.

Keystone submitted that one way to reflect the business intent would be to make changes to the definitions in the Tariff that distinguished between Haskett (Base Keystone) and Monchy (Keystone XL) shippers based on their contract delivery points in the U.S. Further clarification would result if those definitions were coupled with a proviso in the “delivery point” definition such that, for the purposes of capacity allocation, unapportioned access to Monchy or Haskett would depend on whether one is a Haskett or Monchy shipper.

Another aspect of the Tariff that was discussed was the allocation of capacity between committed and uncommitted shippers. Keystone indicated that a specific reservation of capacity for uncommitted volumes is not included in the Tariff and that such an explicit recognition in the Tariff is not legally required. In support of this assertion, Keystone submitted that Article 19 of the Tariff stated that the Tariff was explicitly subject to all decisions and orders of any regulatory authority having jurisdiction, including the NEB. Keystone indicated that it would have no objection to making an addition to the Tariff if directed to do so by the Board.

In Keystone's view, the Board's determination of whether or not to recommend the issuance of a CPCN could be made without Keystone first filing a revised Tariff. According to Keystone, the Board also has the power to issue an approval pursuant to Part IV of the NEB Act for the Tariff along with a direction that Keystone file changes to the Tariff to the Board's satisfaction. This revised Tariff would reflect the business intent of the parties and could make an explicit reference to the reservation of spot capacity. Keystone submitted that if Keystone XL were to be approved, Keystone could make the requisite changes based on the Board's direction and refile the Tariff for the Board's approval since the applied-for pipeline would not come into service until late 2012.

VMSC

VMSC submitted that the applied-for Tariff would create a very reasonable and economically viable project.

Enbridge

Enbridge was of the view that Keystone's request for approval of the Tariff must be denied since it was clear from the evidence that the Tariff did not reflect Keystone's business intent. Enbridge argued the Board could not approve a tariff that it knows is wrong.

In the absence of an approved tariff that specifies Monchy as a delivery point, Enbridge submitted that there would be no way for the Board to conclude that Keystone XL shippers had a right or that Keystone had an obligation to make deliveries to Monchy. Enbridge expressed the view that this would be fatal to the Keystone application since the Board could not approve the construction of new facilities to Monchy when there is no evidence of right or obligation to ship to Monchy.

5.5 Keystone's Designation for Financial Regulation

Views of the Parties

Enbridge

In its final argument Enbridge submitted that Keystone would be more properly regulated as a Group 1 company if Keystone XL were to be approved. In support of this position, Enbridge indicated that the Keystone system would have a capacity of almost 1.3 million barrels a day, would have 13 different contracted shippers and would have more than 400,000 barrels a day of uncontracted capacity available for other shippers and for which tolls would need to be set and approved by the Board.

Views of Keystone

In its reply argument Keystone objected to the manner in which Enbridge presented the issue of Keystone's designation for financial regulation. Keystone argued that it would have been more appropriate to introduce this new issue in a manner that provided Keystone and other parties an opportunity to respond.

Views of the Board

Open Season, Uncommitted Capacity and Common Carrier Status

Subsection 71(1) of the NEB Act requires that an oil pipeline company offer service to any party wishing to ship oil on its pipeline. This provision is the foundation of the “common carrier” obligation for NEB-regulated oil pipelines. The Board has indicated in previous decisions that an oil pipeline meets its common carrier obligations when an appropriate open season is conducted for new facilities or services, and sufficient capacity is made available for uncommitted volumes. In addition, the Board has sometimes considered the ability of the pipeline to readily expand its facilities.

In this case, the Board is satisfied that the open season conducted for the Keystone XL Pipeline was adequate since interested parties had a fair and equal opportunity to participate and contract for capacity on the Pipeline. Furthermore, the Board notes that no parties to the proceeding disputed the validity of the open season conducted by Keystone.

Regarding the amount of capacity to be set aside for uncommitted volumes, the NEB Act does not prescribe a specific level of capacity that should be reserved to maintain common carrier status. In the Board’s view, the determination of an appropriate level of capacity to be set aside for uncommitted volumes is a matter of judgment and based on the circumstances of any specific case.

The Board notes that it is Keystone’s intention to use the Keystone XL Pipeline to transport the 24 600 m³/d (155,000 b/d) of committed Cushing volumes despite the fact that those volumes were originally used to justify the Cushing expansion. Also, both Base Keystone and Keystone XL committed shippers would benefit from certain diversion rights enabling volumes to be diverted from one pipeline segment to another. Furthermore, Keystone acknowledged that the Keystone system would be operated on an integrated basis, as demonstrated by the proposed variable toll methodology. Based on these factors, the Board is of the view that its determination of the appropriate level of reserved capacity for spot shipments should be based on the entire Keystone system and not the Keystone XL Pipeline on a stand-alone basis.

With the approval of Keystone XL, the Keystone system would have a total capacity of 205 300 m³/d (1,291,000 b/d), thereby significantly increasing its importance as a major oil export pipeline. The Board agrees with Keystone’s evidence to the effect that the ability to ship on an uncommitted basis on the Keystone system would provide Canadian producers with added flexibility to respond to market conditions and create opportunities to develop a broader range of U.S. customers and

market opportunities. From a Canadian public interest perspective, these are factors that would, in the Board's view, suggest in this case that the level of reserved uncommitted capacity should be set at the higher end of the range.

The Board also acknowledges that this view must be balanced by the fact that Keystone is a commercially at-risk pipeline that needs to manage throughput and underutilization risks. The Board accepts that Keystone also needs to maintain the operational flexibility of its system. The Board is of the view that the level of capacity to be reserved for uncommitted volumes must not compromise the viability of commercially at-risk infrastructure. The Board is also cognizant that unapportioned access has value for certain shippers and this value needs to be maintained whenever possible. After weighing the above-mentioned considerations, the Board has determined that Keystone should reserve 12% of the total capacity of the Keystone system for uncommitted volumes once the Keystone XL Pipeline comes into service.

The Board is satisfied that this level of uncommitted capacity, in combination with the open season process, will enable Keystone to maintain its common carrier status, subject to other Board directions to be provided in the Tariff section below.

Tolls

The Board has considered AFL's assertion that the applied-for toll methodology and resultant toll differential could give rise to cross-subsidization from light oil to heavy oil shippers which would create distortions in the incentives to invest in upgrading facilities in Alberta and impact the creation of value-added jobs in Canada.

The Board is of the view that having an appropriate economic environment which fosters job creation and technological innovation is an important aspect to consider in its decision. However, the toll differential, even if a degree of cross-subsidization were found to exist between light oil and heavy oil shippers, has not been demonstrated to be an important factor in investment decisions to build upgrading facilities in Alberta. Based on the evidence filed in this proceeding, the heavy/light differential and the capital cost environment are the main factors that affect such decisions. Furthermore, the Board is of the view that the Keystone XL Pipeline could actually contribute to a business environment where upgrading raw bitumen in Canada is made possible because of the existence of pipeline infrastructure capable of transporting a wide variety of crude oil.

In assessing the toll methodology and the evidence filed by AFL, the Board considered whether the alleged cross-subsidization from light to

heavy oil shippers could reach an extent where the resulting tolls would be unjustly discriminatory, contrary to section 67 of the NEB Act. The Board notes that Keystone's evidence indicates that there would be very little difference in capital costs to construct a light instead of a heavy oil pipeline. Though disputed, AFL provided no evidence that contradicted Keystone's evidence in this regard. As a result, the Board finds that capital cost differences would not support a significant differentiation in the fixed component of the tolls and any concern related to cross-subsidization would not result in unjust discrimination. In the Board's view, the difference in cost of shipping heavy versus light oil is reflected in the variable component of the toll. The Board also notes that tolls for Keystone XL are market-based rather than cost-based and are the result of negotiations between sophisticated parties who will likely ship both heavy and light crude oil. The Board is of the view that the pipeline design, which drives capital costs, will benefit both light and heavy oil shippers thereby significantly reducing the concerns of cross-subsidization between these two groups of shippers. The Board further notes that no prospective shippers raised any concerns regarding the tolling methodology. Based on these considerations, the Board finds that charging the same fixed toll for light and heavy crudes would not result in unjust discrimination.

The evidence in this proceeding did not convince the Board that the potential cost difference of building a pipeline capable of shipping only light oil instead of a pipeline capable of shipping a wide range of crude would significantly impact the fixed component of the committed tolls. Consequently, the Board will not require Keystone to undertake a detailed study to determine the actual cost differences for transporting different qualities of crude.

The Board finds that the proposed committed toll methodology will produce tolls that are just and reasonable, given that the methodology resulted from negotiations between sophisticated parties, and the Board's views above with regards to the proposed toll differential. The Board has considered the proposed toll structure whereby committed tolls would decrease with the length of contract term and uncommitted tolls would be set at a premium of 20 per cent over the 10-year committed toll. The Board accepts that this is a reflection of shippers having provided differing levels of financial support to the Keystone XL Project and accepting differing levels of risk. Therefore the Board finds that no unjust discrimination would result from this proposed toll structure and that the 20 percent premium for uncommitted tolls is just and reasonable.

In the event Keystone determines the uncommitted toll to be uncompetitive, Keystone will be required to file with the Board the revised toll with supporting documentation including an explanation of the discounting mechanism.

Tariff

Since the commercial intent of the Project was clarified before the end of the OH-1-2009 proceeding, the Board does not require a revised Tariff for making a determination with respect to Part III of the NEB Act. However, the Board is not prepared to approve the Tariff as applied for because, in the Board's view, it needs to be amended in at least two aspects.

The first aspect is the extent to which the Tariff adequately reflects the business intent of the parties as it related to the allocation of unapportioned capacity between Keystone XL shippers and Base Keystone shippers. In the Board's view, this is an important aspect of the Project as it would govern Keystone's ability to use the Keystone XL Pipeline to transport Cushing volumes. The Board is satisfied with Keystone's proposed approach to address the issue by making changes to the relevant definitions in the Tariff.

The second aspect relates to a specific recognition in the Tariff of the capacity to be reserved for uncommitted volumes. In the Board's view, despite the presence of Article 19 of the Tariff, Keystone's commitment not to contract the capacity set-aside for spot volumes for long-term service is insufficient to ensure that this capacity will be available to spot shippers on a monthly basis. As a result, the Board is of the view that to enable the equitable treatment of these shippers, the Tariff should explicitly reserve a portion of capacity for uncommitted volumes. Consequently, the Board directs Keystone to make an explicit reservation of spot capacity in the Tariff in such a way that would avoid situations where committed shippers could make nominations that would occupy some of the pipeline's capacity reserved for spot shipments on a priority basis over uncommitted shippers.

The Board recognizes that tariffs are living documents that need to evolve through time in order to adapt to new business needs and market circumstances. However, before approving such a document, the Board needs to ensure that it is up-to-date to the extent that can be reasonably expected. As a result, Keystone is required to file with the Board for approval a revised Tariff before Keystone XL goes into service. The revised Tariff will need to address the two aspects described above. This does not preclude Keystone from making other changes to the Tariff, with appropriate justification, if those changes are deemed necessary.

The Board notes that the documents filed confidentially pursuant to order MO-13-2009 were not relied upon in assessing the applied-for toll methodology or the Tariff.

Keystone's Designation for Financial Regulation

With the addition of Keystone XL, the importance of the Keystone system as a major oil export pipeline system in Canada would increase significantly. Even if tolls on the Keystone system continue to be determined through negotiated agreements rather than on a traditional cost of service basis, the Board is of the view that Keystone's designation as a Group 2 company for the purpose of financial regulation would need to be re-examined in a meaningful manner. Accordingly, should Governor-in-Council (GIC) approve the issuance of a CPCN, within 60 days of the receipt of the certificate Keystone is directed to file with the Board any comments it may have with regard to the issue of whether it should be regulated as a Group 1 or Group 2 company. As appropriate, the Board will then provide further direction, such as a timeline for comments from other interested parties.

Chapter 6

Engineering

In its examination of pipeline and facility applications, the Board considers relevant engineering issues to ensure that the applicant will design, construct and operate its proposed facilities in a safe and secure manner. The Board examines issues such as the suitability of the proposed design, facilities operation, integrity management, security, emergency management and preparedness, and health and safety of employees.

When a company designs, constructs, operates or abandons a pipeline, it must do so in accordance with the Board's *Onshore Pipeline Regulations*, 1999 (OPR-99), the commitments made during the Board's hearing process and the conditions attached to any approval. OPR-99 references various engineering codes and standards including the Canadian Standards Association (CSA) Z662 Oil and Gas Pipeline Systems (CSA Z662). The Applicant is responsible for ensuring that it follows the design, specifications, programs, manuals, procedures, measures and plans developed and implemented by the company in accordance these requirements.

6.1 Description of Facilities

The Keystone XL Pipeline Project consists of the construction of approximately 529 km of new 914 millimetre outside diameter nominal pipe size 36 inch pipeline from Hardisty, AB to Monchy, Saskatchewan (SK) (Figure 2-1). The Project will have an initial capacity of approximately 111 300 m³/d (700, 000 b/d) of commodity and is designed to be expandable to 143 100 m³/d (900,000 b/d). The Project will also include related physical works including: eight pump stations, storage tanks and other related works and activities including 32 mainline valves, cathodic protection for the pipeline, and pig launcher and receiver facilities.

Description of the Project within the Keystone System

The Project would be part of the larger, Canada-U.S. Keystone pipeline system. The Keystone system consists of the Keystone pipeline from Hardisty, AB to Haskett, MB, the Cushing Expansion of the Keystone pipeline (Base Keystone) and, once it is constructed, Keystone XL. All of the components of the Keystone system would be operated on an integrated basis. However, Keystone submitted that Keystone XL is not an expansion project in the traditional sense but a bullet-line to provide supply to the USGC. There would be a bullet-line pipeline segment extending from Hardisty to Steele City, referred to as the Steele City Segment, and a pipeline segment running from Cushing to the USGC, referred to as the Gulf Coast segment. The bullet-line approach is intended to minimize and reduce the impact of the co-mingling of dissimilar products that occur with the batch transport of oil.

In order to achieve the total weekly volumes each receipt point on the Keystone system requires, the Cushing Extension will run at full capacity, 7 days a week. This will enable the appropriate volumes from Hardisty to be received at both Cushing and the USGC.

In the overall Keystone system (including Keystone XL) the Cushing Extension, from Steele City to Cushing, is considered to be a bottleneck because it would be moving volumes from both Base Keystone and Keystone XL. According to Keystone, the 200,000 barrels a day of extra capacity from Hardisty to Steele City would overcome the constraints imposed by the bottleneck. If the flow was constant for the week, the flow rate would be 500,000 b/d but the bottleneck at the Cushing Extension would mean that the flow would only be running for five days out of seven. This type of flow is referred to as start/stop operation. The sizing of Keystone XL addresses the intermittent start/stop sequence of Steele City to Cushing and Cushing to USGC and the timing of the volumes down the system. The KXL pipeline's flow rate of 700,000 b/d would enable it to run for five days out of seven. For two days full flow would go to Cushing resulting in a weekly average delivery rate of 200,000 b/d, and for 5 days full flow would go to USGC resulting in a weekly average delivery rate of 500,000 b/d.

6.2 Design, Construction and Operation

The Keystone XL project is designed to batch transport products ranging from heavy blend crude oil to synthetic crude oil. The bullet-line methodology is intended to reduce product degradation that results from co-mingling dissimilar products during pipeline operation.

Keystone submits that this design has minimal interconnections within the mainline and avoids the co-mingling of products that would reduce the product integrity its shippers desire. In addition to reducing interconnections, breakout tanks will not be required at mainline pump stations because pipeline is sized such that the delivery rates required by the delivery points are matched by the maximum capacity of the pipeline. The system supports direct pipeline injection from shippers, and large batch sizes can be transported, which reduces the co-mingling of products that occurs in the boundary between different batches.

Keystone submitted that it had determined the size and location of the pump station locations based on the environmental footprint, the cost, and optimizing hydraulic efficiencies.

A construction safety program has been established and implemented for the Base Keystone system. Keystone has advised the Board that it will implement the same safety program for the Keystone XL project as has been used on the Base Keystone system. Keystone proposed utilizing their existing Pipeline Integrity Management Process to maintain, reduce and mitigate risks to safety and the environment during the operation of the pipeline. It indicated that the proposed facilities would be designed, constructed and operated in accordance with the Board's OPR-99, CSA Z662-07, and all other applicable standards, specifications and codes referenced in its application.

Keystone XL has committed to having an emergency response plan for its Project that will meet regulatory requirements. This plan would be completed in advance of the Project's in-service date to provide time to train emergency response personnel.

Views of the Parties

Enbridge

Enbridge submitted that Keystone XL has been designed with too much capacity. Keystone's argument is that the need for 700,000 b/d capacity is being driven by a bottleneck in facilities on the Steele City to Cushing Expansion pipeline. However, if the Project were designed with lower capacity out of Hardisty, Keystone could build a new line from Cushing to the USGC or, alternatively, install breakout facilities in Steele City. This would also allow pump facilities to be removed from the current 36- inch pipe design.

BP

BP questioned whether designing the Hardisty to Steele City portion of the pipeline with 700,000 b/d capacity was the most economic and efficient engineering design option to address the bottleneck that would exist in a 200-300 mile segment of the Keystone system. It suggested that the extra capacity from Hardisty would not be necessary if the bottleneck were fixed where it existed.

Dale and Shirley McInnes

Landowners Dale and Shirley McInnes expressed concerns with location of the Grassy Lake pump station. The McInnes' legal representative, Mr. Carter, questioned Keystone about the impact of moving the station to satisfy several concerns expressed by his clients. This will be further discussed in Chapter 7 of these Reasons.

Views of Keystone

Keystone submitted that the Project was appropriately designed. It stated it did not disregard the concerns of Mr. and Mrs. McInnes in siting the Grassy Hill Pump Station. Mr. Cabrejo testified that hydraulic constraints limited the range of station movement to that of a few kilometers from the preferred location. Any movement beyond that distance would require more facilities to be added to the final design. System hydraulics, access to the station, proximity to existing power infrastructure, environmental sensitivities, proximity to houses, constructability and stakeholder input were all considered with respect to the pump station site and Keystone chose the optimal location.

Views of the Board

The Board is satisfied that the proposed Keystone XL Pipeline will be designed, constructed and operated in accordance with the NEB Act, OPR-99, CSA Z662-07, and all the applicable standards, codes, and specifications. The Board also expects Keystone to meet all the commitments it has made in this hearing regarding the safety of construction and operation.

The Board considered the McInnes' concerns about the placement of the Grassy Creek pump station. However, the Board finds that the Project is designed to be hydraulically efficient and that this has resulted in the hydraulically optimal placement of the pump stations within the constraints identified by the applicant. As for the sizing of the pipeline, the Board accepts Keystone's evidence regarding the bottleneck constraint and is of the view that the engineering design will address this constraint and allow Keystone to meet its shipping obligations.

To help ensure the safe construction and operation of the proposed Keystone XL Project, the Board accepts Keystone's commitment to follow the same safety program submitted for the Base Keystone Project and to use TransCanada's Health, Safety and Environment Management System.

The Board's expectations for emergency management are based on the requirements of the OPR-99 and the CSA-731-03 Emergency Preparedness and Response (CSA-731-03).

Keystone XL will be required to apply for leave to open prior to commencing operation of the facilities. Prior to granting leave to open the Board will ensure that the facilities can be operated in a safe and secure manner.

Chapter 7

Land Matters

The Board requires applicants to provide a description and rationale for both permanent and temporary lands required for a project in order to assess the extent of the land to be affected by a project. In addition, applicants are required to advise the Board if they intend to use existing land rights, or if there are areas where new land rights will be acquired on a permanent or temporary basis, and how these land rights will be acquired.

The Board also requires a description of the land acquisition process including the planned timing of acquisition and status of acquisition activities. Applicants must provide the Board with a copy of the sample notices provided to landowners under subsection 87(1) of the NEB Act as well as all forms of acquisition agreements.

7.1 General Route Considerations

The Keystone XL Project will include the pipeline and various associated facilities as described in Chapter 2 of these Reasons.

Corridor and route selection were evaluated by an interdisciplinary team at Keystone using existing reports, public information, aerial photography, field work and data gathered during the routing of the Base Keystone pipeline. Within the preferred pipeline corridor, the Keystone team selected a preferred pipeline route and then sited the pump stations based on several criteria, as described in Chapter 6.

The evaluation criteria used to select a corridor included:

- minimizing length to reduce the overall environmental and socio-economic footprint and ensure facilities are economical to construct and operate;
- paralleling existing infrastructure, wherever practical, to reduce new RoW and Temporary Work Space (TWS) and minimize potential effects on environmental resources and agricultural operations;
- limiting the number and complexity of major river crossings and road, rail and utility crossings; and
- avoiding, where practical,
 - environmental and land use features, such as areas of unstable terrain or problem soils or known sensitive areas (e.g., wetlands, river valleys and springs);
 - sites with known occurrences of provincially or federally listed wildlife and plant species;
 - lands of specific status, such as parks, protected areas, cemeteries and historic sites; and
 - concentrated rural residences and urban developments.

Keystone identified a one kilometre wide corridor within which the detailed route of the pipeline will be located. The route will begin near the Hardisty B Terminal, at LSD SW32-42-9-W4M, in AB, cross into SK, and continue to a point on the Canada-US border near Monchy, SK, LSD SE4-1-12-W3M. (Figure 2-1)

The selection of the corridor was based on the fixed control points of the Hardisty Terminal Site, suitable crossings of the Red Deer River, South Saskatchewan River and Frenchman River; and an international border crossing linking to the U.S. segment of the Keystone XL Pipeline, located near Monchy, SK. For the Alberta segment corridor, Keystone considered paralleling the existing Keystone Pipeline.

Alternatives to the existing Keystone pipeline RoW were also considered for the segment of Keystone XL from Hardisty to Gooseberry Lake and from the Red Deer River crossing to the AB-SK border. These options were not found to be suitable because of issues around constructability, terrain, industrial congestion, and in some cases, additional non-contiguous RoW length would be added.

The total length of non-contiguous RoW is approximately 69 km, with 51 km in AB and 18 km in SK. The rest of the pipeline will be alongside or contiguous to existing pipeline RoW for approximately 460 km of the total 529 km.

For the Saskatchewan segment, the Foothills Pipeline RoW provided a suitable corridor to parallel from the AB-SK border to the international border crossing.

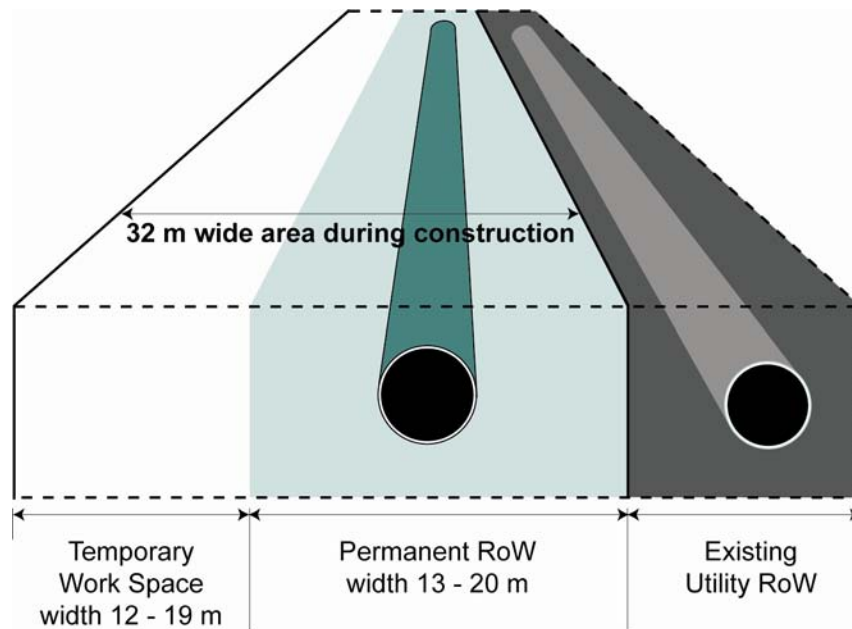
Keystone continues to assess the need for route modifications to address issues that are site specific or in response to landowner concerns.

7.2 Physical Land Requirements

To accommodate construction of the Project, new permanent RoW and TWS will be required. New permanent RoW 13 to 20 metres wide will be acquired through RoW agreement from private landowners, with an additional amount of TWS in some locations which will measure 12 to 19 metres wide. The total width of RoW (including TWS) during construction will be approximately 32 m wide. Please see diagram below.

The change in width of the RoW will occur where RoW will be adjoining, sharing or overlapping existing RoW. Where available and practical, temporary working rights will be obtained from existing contiguous RoWs to reduce the amount of new disturbance. In areas with native prairie, the Project will attempt to reduce the construction RoW width as much as possible. TWS will be required at road, pipeline, and water course crossings and various other locations where site-specific requirements need to be addressed. These will vary in shape and size.

Figure 7-1
Sample Diagram of Contiguous Segment RoW



The RoW will be reclaimed after construction, with the new permanent right-of-way maintained for pipeline operations. The NEB also designates an area which extends about 30 metres beyond both sides the RoW, as a safety zone³, where certain activities are restricted without first obtaining clearance from either the company or the NEB. Following post-construction reclamation activity, the pipeline would operate until such time as an application for decommissioning or abandonment was made. Keystone indicated that it had taken into account both current regulations as it related to abandonment in developing its plan for the Keystone XL Pipeline. Keystone further submitted that it would comply with any changes to the regulations which may be the result of the Board's Land Matters Consultation Initiative actions.

The Hardisty B Terminal and additional pump stations will be located on private lands and these lands will be acquired through fee simple purchase or through long-term surface leases. The Hardisty B Terminal will require an estimated 16.2 hectares of lands, while each pump station will require approximately 2.5 hectares of land. Keystone submitted that the land acquisition for these pump stations would take place starting in September 2009. At the time of the oral hearing, these lands had not yet been acquired.

Dimensions and locations required for the cathodic protection beds will be determined during detailed design. Thirty-two main line valve sites will be required, twenty-four of these will be contained within easements already obtained for the Base Keystone project, the other eight will be located within boundaries of pump stations.

3 For more information about the 30 metre safety zone, please refer to section 112 of the NEB Act or to the NEB publication "Living and Working Near Pipelines", which can be obtained online at <http://www.neb-one.gc.ca/clf-nsi/rthnb/nvlvngthpbic/Indwnr/Indwnr-eng.html> or from the NEB Library (ask for it by title or ISBN 0-662-39386-4).

Views of SCC

SCC submitted that the Keystone XL application failed to assess pipeline decommissioning and that failure to do so was not in the public interest. SCC further indicated that full disclosure for the public interest would require that Keystone assess the decommissioning or abandonment and impending financial liability of the Keystone XL Pipeline. Without this critical information, SCC was of the view that Keystone could not provide an assurance to Canadians that they will not have to cover the costs associated with the decommissioning and abandonment of the Keystone XL Pipeline.

7.3 Land Acquisition and Notification

Keystone submitted that it would comply with the land acquisition provisions and regulations, including sections 86 and 87 of the NEB Act. Along with the section 87 notice, landowners received detailed Project information. Keystone submitted sample documents of section 87 of the NEB Act notices to landowners, and section 86 of the NEB Act agreements for the various types of land rights required.

For this Project, 42 percent of lands required in Alberta will be acquired from the Crown, while in Saskatchewan, 32 percent of the lands required will be acquired from the Crown. Keystone will survey and review the plans for the location of the facilities with the affected Crown agencies and parties. Keystone does not anticipate any issues in the acquisition of these lands. Refer to Table 7.1 for detailed lands information.

Table 7.1
Summary of Land Information

Segment	Alberta	Saskatchewan	TOTAL
Length of Pipeline (km)	269	260	529
Number of Landowners	110	171	281
Number of Occupants (on private and Crown land)	90	90	180

Within the kilometre wide corridor, Keystone identified affected landowners and had served almost all of these landowners with section 87 notices as of 23 September 2009. At the time of the OH-1-2009 proceedings, the acquisition of land rights in Saskatchewan was 99 percent complete while in Alberta it was 80 percent complete.

Views of the Board

The Board finds that the route evaluation criteria applied by Keystone are appropriate and that it is reasonable to locate the majority of the Project route alongside and contiguous to the existing RoWs in order to minimize the environmental and socio-economic impacts of the Project.

The Board finds that Keystone's anticipated requirements for permanent and temporary land rights, including the varied width of RoW, acceptable. The land rights documentation and acquisition process proposed by Keystone are also acceptable to the Board.

The Board notes that approval of this Project includes approval for the general route or one-km wide corridor, as applied for. The Board wishes to note that a determination of the detailed route will be made at the post-certificate stage and will be subject to the process set out in sections 31-35 of the NEB Act.

With respect to abandonment, an application needs to be filed pursuant to the NEB Act if and when facilities are to be abandoned. As a result, the NEB provides regulatory oversight during the abandonment phase and Keystone will be required to comply with applicable regulatory requirements at that time, as well as any conditions attached to any approval for abandonment. The Board has committed to further address the physical and financial issues related to abandonment through its Land Matters Consultation Initiative Stream 3 and 4 actions.

Chapter 8

Public Consultation

The Board promotes the undertaking by regulated companies of an appropriate level of public involvement, commensurate with the setting, nature and magnitude of each project. The Board considers public involvement to be a fundamental component during each phase in the lifecycle of a project in order to address potential impacts. The Board's assessment of consultation with Aboriginal peoples is discussed in Chapter 9, Aboriginal Consultation.

8.1 Keystone's Public Consultation Program

Keystone adopted TransCanada's consultation practice, which is to develop and adapt consultation programs according to the nature, location and effects of a project and the interests, information needs and concerns of various stakeholder groups. The overriding principle of the consultation program is that stakeholders are to be engaged in a fair, honest, consistent and timely manner by Keystone's representatives to ensure they are aware of and have access to relevant Project information, are given an opportunity to ask questions and raise concerns, and have the opportunity to work with Keystone toward resolution of outstanding issues.

Keystone recognized that the purpose, scope and intensity of consultation needed to vary according to the needs and interests of specific stakeholder groups, such as landowners. As a result, stakeholder consultation and communication varied according to anticipated and actual concerns, interests and information needs. Keystone used various factors to determine stakeholder concerns, interests, and needs including: proximity to the route; the potential impact the Project would have on each stakeholder group; the expected timing of potential impacts on various stakeholders; and, additional information gathered during previous consultation activities for the Base Keystone Pipeline project and initial activities for the proposed Project.

Keystone initiated its consultation program in March 2008 at the outset of the Project planning process. The program involved a variety of activities including direct contact with landowners, meetings with interest groups and government officials, public notices, open houses, the establishment of Project toll-free telephone lines, a Project e-mail address and Project website.

Keystone stated that consultations would continue through the construction phase and into operations when stakeholder engagement will transition from the Keystone project team into TransCanada's ongoing Integrated Public Awareness Program and Land, Aboriginal and Community Relations group.

Views of the Parties

Dale and Shirley McInnes filed an application for intervenor status based on concerns related to the proposed location of the Grassy Creek pump station and impacts that this location could have on their property and lifestyle. During the oral portion of the hearing, Mr. and Mrs. McInnes expressed concerns regarding the consultation program undertaken by Keystone. They indicated

that Keystone's consultation program was, in their opinion, insufficient and they provided specific examples of how Keystone failed to provide them with the information they requested or answers to their questions.

The McInnes' also raised the fact that Keystone did not appear to properly document the consultation program given that the McInnes' concerns were not acknowledged within the application submitted by Keystone in February 2009, despite Keystone having become aware of their concerns in the previous year.

Views of Keystone

Keystone stated that stakeholder and community relations are a priority and that it is committed to building and maintaining positive relationships in the communities where its employees live and work. However, Keystone also acknowledged that its engagement with Mr. and Mrs. McInnes had not been perfect. Keystone explained that it had stated in its application in February 2009 that there were no outstanding concerns from residents since it was still involved in discussions with the McInnes' at that time and were hopeful that a resolution would be reached. Keystone further explained that once the McInnes' had engaged legal counsel, Keystone were no longer able to have discussions directly with them.

Keystone committed that it would continue to engage with the McInnes' in order to attempt to resolve their concerns.

Views of the Board

The Board finds that the design of the consultation program undertaken by Keystone for the Keystone XL Project was appropriate for the nature of the Project. The consultation program identified potentially affected stakeholders, used appropriate methods to engage members of the public and established procedures for responding to issues and concerns.

The Board notes that Keystone submitted statements in its application indicating that there were no unresolved stakeholder concerns when, in fact, there were outstanding and unresolved issues. Keystone indicated that it had submitted these statements because it hoped to resolve all outstanding issues prior to the oral portion of the hearing. The Board understands this factual inaccuracy to be with respect to consultation involving the McInnes' and the six other landowner intervenors who resolved their concerns prior to the oral portion of the hearing but subsequent to the submission of the application. The Board wishes to remind Keystone that information in an application must be accurate at the time of submission and should not merely reflect what the applicant hopes will be accurate at some future date.

Keystone did eventually acknowledge that its engagement with the McInnes' was "not perfect". From the evidence, it appears that neither Keystone nor the McInnes' legal counsel made meaningful efforts to

consult once the McInnes' had retained legal counsel. The result of this was that the McInnes' were required to attend the oral portion of a hearing in order to obtain information typically available in an information session. The Board does not consider this to be an optimal use of either a participant's or the Board's resources. Had meaningful dialogue between the McInnes' and Keystone occurred, the McInnes' concerns might have been addressed without the need to intervene in the hearing. The Board notes that Keystone has committed to continuing its consultation with the McInnes' and to working with them to determine an acceptable solution. The Board encourages both parties to engage in productive discussions and to work towards a satisfactory resolution to all outstanding issues.

The Board also expects companies to respond to any complaints received from landowners or the public throughout the life of a project and notes that Keystone has committed to do so.

In the circumstances, the Board imposes Condition 18 which directs Keystone to maintain and, upon request, file with the Board, consultation and complaint monitoring reports.

The Board finds that the consultation program undertaken by Keystone for the Keystone XL project, when coupled with Keystone's stated commitment to work to resolve outstanding concerns and the Board's condition regarding ongoing landowner consultations is adequate.

Chapter 9

Aboriginal Consultation

Whenever a project has the potential to have an impact on Aboriginals' rights or interests, the Board ensures that it obtains as much evidence as possible so that it may assess the potential impacts and factor that consideration into its final decision. In order to ensure its record is as complete as possible, the Board has established a process with three key components:

- As set out in the Board's Filing Manual, project proponents must identify, engage and consult with potentially affected Aboriginal groups prior to the filing of the application. The proponent is required to hear the concerns of such groups and attempt to address their concerns to the extent possible before filing an application. The proponent must report on this work in its application, including any unresolved Aboriginal concerns. Aboriginal groups are encouraged to engage with the proponent so that their concerns may be identified early and there is a greater chance for their concerns to be met before the application is filed.
- Under the Board's Enhanced Aboriginal Engagement initiative, the Board reviews the list of potential affected Aboriginal groups identified in the proponent's project description filed with the Major Project Management Office (MPMO). The MPMO or the Board may suggest revisions to the proponent's list. The Board sends out a letter to each Aboriginal community or organization on the revised list, informing them of the project, the Board's regulatory role concerning the project, and offering to provide further information on the hearing process. Board staff follow up on the letters, sending out information and holding meetings where requested.
- The Board encourages Aboriginals with an interest in the project to make their views known directly to the Board by participating in the hearing process.

9.1 Enhanced Aboriginal Engagement

For the Keystone XL Project, the Board carried out Enhanced Aboriginal Engagement activities between the receipt of the Project Description 18 July 2008 and receipt of the Project Application 27 February 2009. Six Aboriginal communities and organizations requested information meetings on the NEB's hearing process; namely, the Alexander First Nation No. 134 (Alexander), the Blood Tribe, File Hills Qu'Appelle Tribal Council, Piikani First Nation, Samson First Nation, and Stoney Nakoda Nation. They also requested and were sent additional information on the hearing process electronically. Poundmaker First Nation did not request a meeting with the Board but was sent information on the Board's hearing process by means of electronic documents.

Six Aboriginal communities and one Aboriginal organization participated in the OH-1-2009 proceeding; five communities participated as intervenors, while one community and one organization filed letters of comment. The intervenors were Nekaneet First Nation No. 380

(Nekaneet), Red Pheasant First Nation No. 108 (Red Pheasant), the Alexander, Sweetgrass and Moosomin First Nations. The Blood Tribe and Federation of Saskatchewan Indian Nations filed letters of comment. The location of each community relative to the proposed Keystone XL route is shown in Figure 9-1.

Procedural Motions

Sweetgrass and Moosomin First Nations (Sweetgrass and Moosomin) filed a motion requesting that they be permitted to cross-examine representatives of several government departments and participants, arguing that this would help them to determine the adequacy of the Crown's consultation efforts. The Board ruled on this request in two letters dated 8 and 10 September 2009 and an oral ruling on 21 September 2009. These rulings are reproduced in Appendix II. Sweetgrass and Moosomin also made a written request for clarification of the Board's role in the Crown's duty to consult, which the Board answered 31 July 2009. They then filed a motion to adjourn the OH-1-2009 proceeding, which the Board denied 18 September 2009. That ruling is also reproduced in Appendix II. Sweetgrass and Moosomin did not take part in the oral portion of the hearing or make a final argument.

9.2 Aboriginal Engagement by Keystone

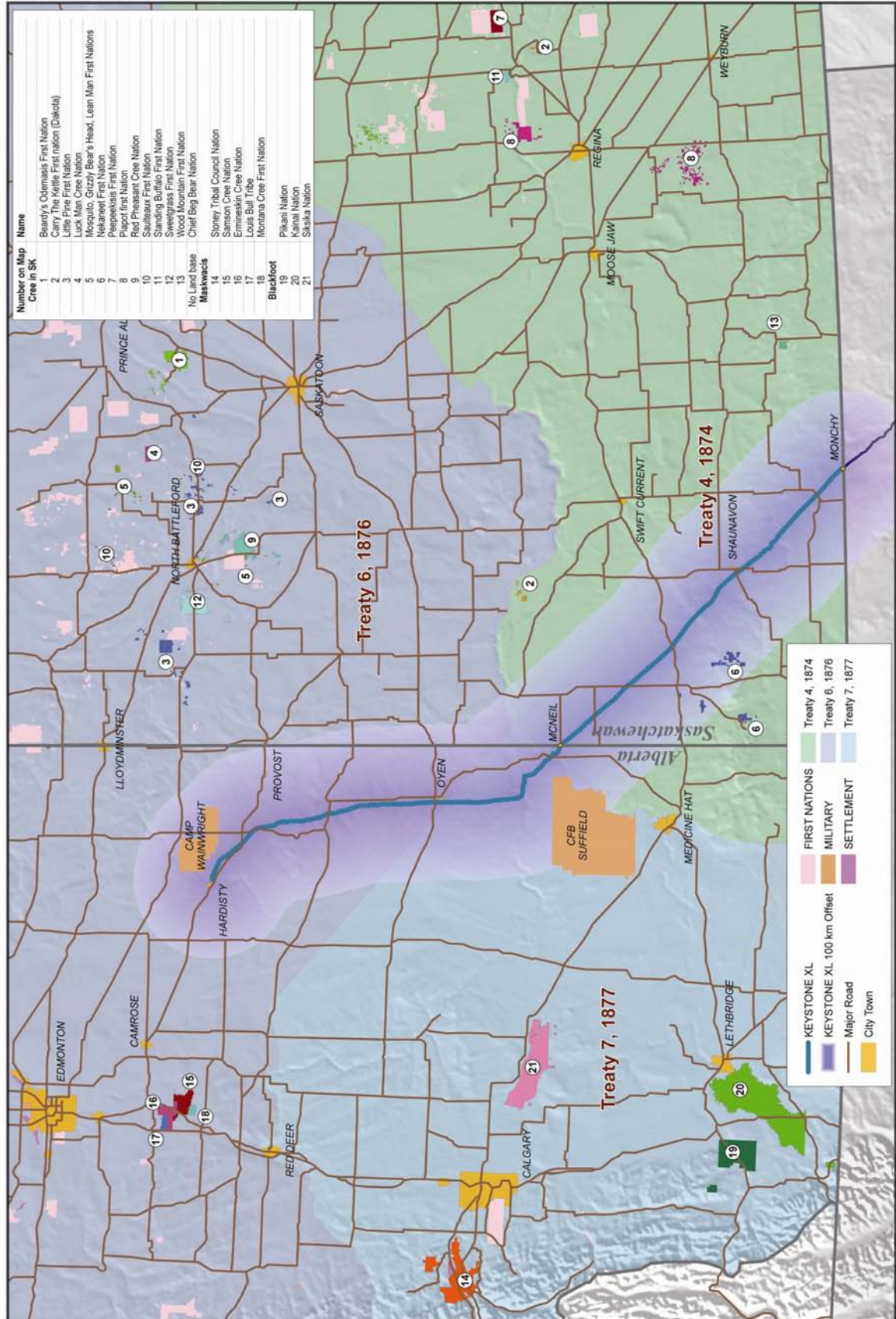
Keystone stated that it commenced work on its Aboriginal Engagement for the Keystone XL Project in the spring of 2008. It said that its Aboriginal Engagement process was intended to:

- Identify the potential effects of the Project on current traditional land use activities;
- Identify sites of cultural and historical importance to Aboriginal people that may be affected by the Project;
- Gather local and traditional knowledge (TK) relevant to the Project;
- Build and enhance relationships relating to community expectations and protocols.

Keystone began its Aboriginal Engagement process by researching the proximity of the Project area to reserves or other lands designated as future reserves under the *Indian Act*, Métis settlements and communities, and areas of traditional land use. Keystone noted that its pipeline route crosses the regions covered by Treaties 4, 6, and 7 but that it does not cross any reserves or lands designated for reserve status. Keystone then developed a contact list of potentially impacted Aboriginal groups based on an initial 50 km engagement zone centred on the Project RoW. Keystone chose the 50 km corridor because it considered this to be a reasonable commuting distance for work. Nekaneet and Carry the Kettle First Nations fell within this 50 km engagement zone.

To validate and update its contact list, Keystone began to contact the Aboriginal communities, organizations, and government officials. The final contact list included seven organizations and 26 First Nations, all of whom were advised of the Project via an information package for review and feedback. If a community or organization did not respond to calls following up on its information package or otherwise express interest in the Project, Keystone did not contact them again.

Figure 9-1
Keystone XL Pipeline Aboriginal Engagement Zone and Treaty Boundaries



Keystone's Aboriginal Engagement tools included open houses, newsletters, advertisements, notices, fact sheets, brochures, telephone calls, a toll-free telephone project line, and a project website. In Keystone's view its most important tools were face-to-face meetings and encouraging the development of 'Aboriginal coalitions.'

In its early Aboriginal engagement work, Keystone stated that Aboriginal communities expressed interest in a collaborative approach to assessing potential project effects. In response to this interest, Keystone assisted in the development of 'Aboriginal coalitions' as a means for communities to work together to gather traditional knowledge and traditional land use information relevant to the Project. The Nekaneet Coalition in Saskatchewan and the Maswacis Coalition in Alberta were formed as a result of this initiative. Keystone stated that the coalitions were formed in recognition that the lands traversed by project were historically occupied Cree, Blackfoot, and Métis.

Keystone reviewed the mitigation recommendations from the Nekaneet and Maskwacis Coalitions and committed in its application to incorporate those recommendations into its construction and environmental protection plans where possible. It also stated that information from Aboriginal communities inside and outside the coalitions was used to guide avoidance and testing of culturally sensitive sites.

Keystone stated that during the construction phase, it would continue to follow its Aboriginal Engagement process. For the operations phase, Keystone stated it would adopt TransCanada PipeLines Ltd.'s Integrated Public Awareness program as a means to continue its Aboriginal engagement.

Views of the Parties

Nekaneet, Red Pheasant and Alexander all expressed the view that Keystone's consultation program was inadequate. Nekaneet said that it had neither sanctioned nor agreed to participate in the coalition named for it, and that the coalition did not meet its consultation needs. Nekaneet described its meetings with Keystone as non-substantive and unhelpful. In her oral testimony, Chief Alice Patayken, speaking on behalf of Nekaneet, testified that she was concerned about Keystone's Aboriginal consultation process because between April 2008 and February 2009 there was no recognized council representing Nekaneet. Chief Pahtayken stated that once she had been recognised as chief, she did contact David Cole, the Keystone XL contact to request a meeting with his superiors, but no meetings had happened yet.

Red Pheasant Band Councillor, Mr. Vince Sauvie, testified that Keystone had not met with its consultation manager and that Red Pheasant never agreed to participate in the coalitions.

In written evidence Sweetgrass and Moosomin expressed concerns with the structure and role of Aboriginal coalitions. They stated that they were not satisfied that these coalitions could represent their concerns and interests, since they had not been contacted by the coalitions or participants in them. Sweetgrass and Moosomin submitted that in any case, Keystone had no independent duty to consult or accommodate, nor could Keystone fulfill the Crown's duty in those areas.

The Board received letters of comment from the Kainai (Blood Tribe) First Nation and the Federation of Saskatchewan Indian Nations (FSIN). Both letters expressed dissatisfaction with Keystone's consultation program. The Blood Tribe noted that it had been in contact with Keystone in an effort to resolve its concerns about potential Project impacts on the Blood community and traditional lands. It declared that it had no meaningful consultation with Keystone up to the date of its letter. The Blood Tribe suggested that this may be due to a misunderstanding through which Keystone may believe other First Nations could speak for the Blood community. Finally, the Blood Tribe urged the Board not to approve the application until meaningful consultation had occurred between it and Keystone. FSIN also stated that not all First Nations potentially affected by the Project had received a Project Description, and questioned the TK study's ultimate validity since it was carried out without FSIN's knowledge or input.

Views of Keystone

Keystone asserted that both Nekaneet and Red Pheasant had made unfounded statements about its Aboriginal Engagement work. Keystone stated that the body of evidence showed a record of engagement with both Nekaneet and Red Pheasant. It declared its appreciation of the participation of Nekaneet members in the TK study for the Project. In addition to its engagement with Nekaneet through the TK study, Keystone stated that it had contacted Nekaneet numerous times, including contacts specifically with Chief Pahtayken. As for Red Pheasant, Keystone acknowledged that there had been no face to face meeting with the Chief-in-Council of Red Pheasant, but stated that it had twenty-six points of contact with the community, twenty-three of which were with the consultation manager for Red Pheasant. It understood from Red Pheasant that it did not agree with and did not wish to participate in the TK study and would only engage in bilateral discussions regarding the Project if a compensation and investment agreement were concluded in advance. Keystone stated that it did not believe that this was a reasonable pre-condition to attach to a project-specific agreement. Keystone sent a letter to Chief Wuttunee of Red Pheasant on 23 July 2009 offering to meet, but it did not receive a response to the letter and has not taken any further action to pursue a meeting.

Keystone stated that participation in the cultural-based coalitions was voluntary and that it was Aboriginal groups that proposed the coalition concept. The First Nations that had expressed an interest in the area of the KXL project have had no access to the lands for the last 100 years as they were privately held or were occupied Crown lands. However, they believed that the lands potentially hold cultural and historic sites. Keystone stated that that field work is ongoing and that it would ask the coalitions to present their information to other Aboriginal communities that have an interest in the Project.

Finally, Keystone stated that it had agreed in principle to pursue a memorandum of understanding with the Blackfoot Confederacy to set parameters for a cooperative relationship and stated it would consider working directly with the Blood Tribe, which is a member of the Confederacy.

9.3 Impacts of the Project on Aboriginal People

Views of Keystone

Keystone summarized the key issues raised by Aboriginal communities for the Project in its application as follows: potential impacts on traditional territories, proximity of the Project to the Great Sand Hills, interpretation of certain heritage and traditional sites, job training, and education. Keystone stated that it understood that none of the lands traversed by the Project were currently being used for traditional purposes, and no Aboriginal communities had advised it of current traditional land use activities on those lands. Aboriginals' access to the lands on the pipeline route for traditional activities has been limited for approximately 100 years. Keystone was able to obtain permission to access lands for the TK study, and stated that Aboriginal communities involved in the study expressed appreciation for Keystone's assistance accessing their traditional lands within the engagement zone. Keystone recognised that some communities had expressed concern about the potential for the Project to affect sacred sites and other sites of cultural and historical importance.

Keystone stated that it has gathered and used information to mitigate or avoid site impacts, and recognized that avoidance of certain sites was the preferred mitigation strategy of Aboriginal communities. In view of that preference, Keystone stated that where possible it would seek to avoid such sites by means of temporary fencing, narrowing of the RoW during construction, relocation of extra workspace, and in some cases by rerouting. Where avoidance is not possible, Keystone stated effects on archaeological resources would be mitigated by archaeological excavation according to the applicable provincial heritage legislation.

Keystone noted a second concern shared by all the Aboriginal communities that responded to the information package was the potential effects of the Project on the boundaries of the Great Sand Hills. It stated that it was continuing to work collaboratively with Aboriginal groups on potential mitigation measures to address this concern. Keystone stated that it was committed to developing a detailed reclamation plan specific to the portion of the Great Sand Hills traversed by the Project, in addition to standard mitigation measures.

Keystone stated in its application that certain vegetation and rock formations located during heritage surveys were interpreted differently by different Aboriginal participants. It acknowledged that this had complicated the process of impact identification and mitigation, but that it was continuing to facilitate dialogue to support the communities as they took part in the process.

Considering economic effects, especially opportunities for employment and training potentially raised by the Project, Keystone stated that where opportunities exist it would work with the communities to build their capacity to take advantage of them. Keystone stated in its application that the coalitions had opted to defer examining these opportunities while land and environmental matters related to the Project are under review. In updates to its evidence since the submission of its application, Keystone noted that it has actively funded training programs for coalition community members and provided information to coalition and non-coalition members to enable their contractors to compete for jobs associated with TransCanada Pipelines Ltd. pipeline projects.

Views of the Parties

Nekaneet and Red Pheasant expressed concerns about potential environmental, spiritual, cultural and historical impacts from the proposed project in both their interventions and their written evidence. They also each requested that the Board protect important cultural sites should the Project be approved, including the Great Sand Hills, tipi circles, and medicine wheels. Each First Nation named several specific sites as well, including the Cypress Hills/Fort Walsh and Assiniboia Mission Massacre [site] for Nekaneet and the areas around Sounding Lake, Battle River, and Eye Hill Creek for Red Pheasant.

Chief Pahtayken testified that Nekaneet members continue to use their traditional lands for ceremonies, medicine gathering, berry gathering, and hunting. When questioned by Board counsel about potential Project impacts, Chief Pahtayken expressed concerns about the pipeline potentially exploding and the overall consultation process. Asked by Board counsel for suggestions on how to mitigate negative Project impacts, Chief Pahtayken recommended following the Creator's laws.

Councillor Sauvie testified that Red Pheasant members continue to use their traditional and treaty territory for hunting, spiritual gatherings and ceremonies, medicine and berry gathering, burials, and offerings to sacred sites. When asked about potential impacts on these activities from the Project, Councillor Sauvie said he could not answer because Red Pheasant did not currently have the capacity to provide that information. He suggested that potential negative Project impacts could be mitigated through appropriate consultation by Keystone.

Nekaneet and Red Pheasant expressed interest in opportunities for economic benefits from the Project in the areas of training, business, contracting, and general employment, especially in the longer term. Nekaneet and Red Pheasant each referred to what they described as an "Aboriginal content clause", and their concern that it should be applied in a way that did not unfairly disadvantage First Nations.

Alexander First Nation, Blood Tribe, and the Federation of Saskatchewan Indian Nations

Alexander stated it had concerns about the Project's potential environmental, spiritual, cultural, and historical impacts. In its letter of comment, the Blood Tribe briefly discussed potential impacts on cultural heritage bound up with its traditional lands and the maintenance of current practices on those lands. The Blood Tribe reiterated that in its view it is necessary to engage them directly in order to identify and handle potential impacts specific to the Blood community.

FSIN stated in its second letter of comment that there were gaps in Keystone's information about potential impacts of the Project on First Nations, giving as an example the hunting areas the Project would cross. It stated that the 50 km engagement zone was therefore flawed as it did not take into account such information.

Sweetgrass and Moosomin First Nations

Sweetgrass and Moosomin stated that they had concerns about the potential impacts of the Project on their treaty and Aboriginal rights, their ability to select lands under Saskatchewan's *Treaty Land Entitlement Act*, and wider concerns about potential environmental, spiritual,

cultural, and economic impacts. They went on to note in their written evidence that the Project would cross their traditional lands, described as encompassing parts of Alberta, Saskatchewan, Manitoba, the Northwest Territories, and the northern United States. On being asked by Keystone and the Board to provide more information on the adverse impacts they anticipate, Sweetgrass and Moosomin stated they would not provide this information until their communities had been meaningfully consulted by the Crown. They repeated this response to the Board's request for recommendations on how to mitigate any negative Project impacts.

Views of the Board

Consultation Process

When reviewing an applicant's Aboriginal consultation program, the Board looks for several things. First, did the applicant identify and contact the right Aboriginal groups? Second, did it effectively identify and, to the best of its ability, address the concerns raised? Third, did it provide comprehensive information to the Board on its activities and on resolved and outstanding issues? The applicant's early engagement with Aboriginal groups is a critical part of the regulatory review process. It facilitates a timely exchange of information and an opportunity for Aboriginals' concerns to be addressed at the project design phase; it can help establish productive relationships that can carry on throughout the life of the project; and it informs the Board of the concerns Aboriginals may have about a project's impacts. The scope and extent of the consultation that needs to be carried out by an applicant is determined, to a large degree, by the nature of the project and its potential to have impacts on Aboriginals' rights and interests.

The Board heard a great deal of evidence about Keystone's Aboriginal engagement program both from Keystone and Aboriginal intervenors. A number of Aboriginal intervenors expressed dissatisfaction with the program and complained that they had not been adequately consulted. After carefully considering all of the evidence, the Board has concluded that Keystone's program was satisfactory and that the appropriate Aboriginal groups had the opportunity to provide their views on the Project either to Keystone, the Board, or both. Keystone's 100 kilometre wide corridor centered along the proposed route of the pipeline was a reasonable starting point for its consultation program. Keystone also contacted and consulted additional groups outside of this corridor when it received recommendations of the Aboriginal groups they had already contacted and those of federal and provincial departments.

The Board finds that the design of the consultation program was adequate for the purpose of identifying and understanding the potential impacts of the Project on Aboriginal people. Despite some communication challenges, Keystone meaningfully engaged Aboriginal groups potentially impacted by the Project or provided a reasonable opportunity for

potentially affected groups to discuss their concerns. The Board is also satisfied that Keystone has committed to ongoing consultation throughout the life of the Project with Aboriginal groups both inside and outside of the community coalitions.

The Board notes that at times Keystone had difficulty in identifying the proper contact within a community or getting a timely response from some groups. The Board expects proponents to make more than one or two attempts to engage with potentially affected Aboriginal groups, but the Board also encourages Aboriginal groups to avail themselves of the opportunity to engage with proponents. While it is certainly not a requirement that Aboriginals do so, it is a very effective way to have their concerns addressed before certain key decisions are made by the proponent. It is open to Aboriginals to bring their concerns directly to the Board but they cannot complain of an inadequate proponent consultation process if they do not make reasonable efforts to identify who their representatives will be or actively engage in discussions with proponents. The Board encourages Keystone to continue to develop its communication protocols with Aboriginal groups, especially where the protocols may assist in resolving confusion about community representation.

The Board notes that some Aboriginal groups that did not participate in the community coalitions had concerns with the TK studies produced by the coalitions. They stated that TK studies produced without their clear input could not adequately meet their needs. The Board is supportive of efforts to approach Aboriginal engagement in innovative and culturally appropriate ways but notes that the use of coalitions should not preclude Aboriginal groups not involved in the coalitions from providing their views to Keystone directly. Keystone should continue to consult with Aboriginal groups with interest in the Project area even if they are not participating in the coalitions.

The Board has proposed a condition that would direct Keystone to continue to consult with Aboriginal groups who have expressed interest in the Project about the details of the construction phase of the Project and its plan for monitoring procedures for the protection of Aboriginal heritage and traditional resources. Keystone would also be directed to provide the Board with an update on its Aboriginal consultation activities prior to the commencement of construction.

Potential Impacts of the Project

In terms of the potential adverse physical impacts of the Project, the Board notes that there were suggestions of current traditional use over the proposed route, but no specific evidence of such use was provided. A significant proportion of the pipeline would be on privately held lands or occupied Crown land and there was no evidence that there would be any

impacts on areas where traditional activities are currently carried out by Aboriginals. The Board therefore has no evidence that there would be any adverse impacts from the Project on traditional use of the land by Aboriginals.

A number of Aboriginal participants, both intervenors and those providing letters of comment, expressed concerns regarding how the proposed Project could impact sacred, historical, archaeological, and otherwise significant sites. The Board notes Keystone's commitment to ongoing Aboriginal consultation and engagement during construction and operation via the implementation of TransCanada PipeLines Ltd.'s Integrated Public Awareness program. As noted above, the Board will impose a condition to this effect. The Board also notes Keystone's commitment to incorporate mitigation recommendations from the community coalitions wherever possible. Should significant sites be discovered, Keystone will be required to implement the procedures defined in the heritage and resource acts of Alberta and Saskatchewan and the provisions in its environmental protection plan.

With respect to concerns expressed about the Great Sand Hill area, the Board notes Keystone's commitment to continue to work collaboratively with Aboriginal communities. The Board also notes that Keystone committed to developing a detailed reclamation plan for the area traversed by its pipeline. Details of environmental effects and mitigation measures related to this area are further discussed in the Environmental Screening Report. The Board will impose a condition to require Keystone to file a detailed reclamation plan specific to this area in its Environmental Protection Plan.

Economic opportunities and capacity building were key areas of concern for all Aboriginal groups that participated in the hearing or provided letters of comment.

Keystone stated in its application that it will take part in capacity-building work with Aboriginal communities, which may include training and jobs related to the Project. So far Keystone has followed through on this commitment through sponsorship of training programs and provision of training and information registration requirements to Aboriginal-run companies. The Board would encourage Keystone to continue to work with Aboriginal communities to ensure they have an opportunity to participate in training and an equal opportunity to compete for work on the proposed project, should it be approved.

Chapter 10

Environment and Socio-Economic Matters

The Board considers environmental and socio-economic matters under both the CEA Act and the NEB Act. The Board requires applicants to identify and consider the effects a project may have on biophysical and socio-economic elements, the mitigation to reduce those effects, the significance of any residual effects once the mitigation has been applied and enhancements of project benefits.

This chapter summarizes the environmental assessment (EA) process used by the NEB in evaluating the Project. It also addresses matters raised during the hearing process and not wholly covered within the CEA Act ESR, including EA process-related questions raised by the SCC. Finally, the chapter covers socio-economic issues not assessed under the CEA Act.

10.1 Environmental Screening Process

The Project as proposed requires a Certificate under section 52 of the NEB Act, which triggers the requirement for an EA under the CEA Act. Since the Project entails less than 75 km of new RoW, as defined in the CEA Act *Comprehensive Study List Regulations*, the Project is subject to a screening level EA under the CEA Act.

Pursuant to the CEA Act *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements* (Federal Coordination Regulations), the NEB coordinated Responsible Authority (RA) and Federal Authorities involvement in the CEA Act EA which was conducted within the NEB hearing process.

Following the oral portion of the hearing, the Board issued a draft ESR on 01 December 2009 for a two week public comment period. The Board received comments from Transport Canada and Environment Canada, along with a response to those comments from Keystone.

The final ESR reflects comments received during the public comment period and the Board's assessment of the bio-physical and socio-economic effects of the Project and mitigation measures, based on the description of the Project, factors to be considered, and the scope of those factors. The ESR also includes recommendations for conditions to be included in any Board regulatory approval and finally an evaluation of the likelihood of significance for any adverse effects.

Views of the Board

With respect to its regulatory decision under the NEB Act, the Board has considered the ESR and the recommendations included therein.

The Board determined in the ESR that, with the implementation of Keystone's environmental protection procedures and mitigation measures

and the Board's recommendations, the proposed Project is not likely to cause significant adverse environmental effects.

As part of the approval for the Project, the Board therefore adopts the recommendations contained in the ESR, and will include these as conditions in the Certificate.

For details regarding the Board's assessment of the environmental and socio-economic effects under the CEA Act, the ESR is included as Appendix IV of these Reasons.

10.2 EA Process- related Questions Raised by the SCC

While the SCC did not file any intervenor evidence, it conducted extensive cross-examination of Keystone and it submitted written final argument. Overall, SCC challenged Keystone on three main areas which it argued Keystone should have addressed:

1. upstream oil sands production and downstream refining and the relationship of these to the scope of the Project and environmental assessment of direct and cumulative effects;
2. Project-related greenhouse gases (GHG) and its associated climate change impacts; and
3. questions around scenarios for early decommissioning.

Views of the Parties

The SCC argued that Keystone did not meet the requirements and accountabilities under section 16 (1)(a) of the CEA Act. The SCC raised questions concerning the details of the past, present or future projects or activities that were considered in the assessment of cumulative effects. The SCC emphasized that Keystone's application and assessment made numerous references to the Alberta oil sands as the primary source of oil for the Keystone XL Pipeline and to the USGC as the refining market. The SCC also raised questions relating to GHG emissions from the oil sands and downstream refining of oil. The SCC sought to establish that upstream oil sands production and downstream refining have a direct correlation and causal relationship to the proposed Project and that Keystone failed to address their direct and cumulative effects in its assessment.

In particular the SCC argued that Keystone did not include cumulative effects from the sourcing of oil or the refining or end use of this oil on climate, air quality, water, wetlands, habitat fragmentation, biodiversity, wildlife, community health, farming and food production.

With respect to GHG emissions from the pipeline itself, the SCC questioned the methodology for predicting the emissions from the Project, including the quantification and analysis of emissions associated with the Project. The SCC argued that Keystone failed to provide a scientifically defensible assessment, inventory, modeling and analysis of GHG emissions and of climate change impacts associated with the pipeline.

Finally, the SCC stated that Keystone failed to present decommissioning scenarios that consider the potential for limited oil supply and demand due to possible emerging climate change legislation in Canada and the United States, such as cap-and-trade and carbon tax policies. These scenarios could constrain oil production which could then lead to underutilization and the need for decommissioning of the Project earlier than its projected 40 year lifespan.

Views of Keystone

Keystone submitted that the scope of this ESA was based on the NEB Filing Manual, sections 15-16 of the CEA Act, and included the physical works for which Keystone applied for as well as the activities and undertakings directly related to those physical works. Keystone's ESA defined the biophysical and socio-economic elements to be assessed and the spatial and temporal boundaries for each of those. Keystone stated that the list of physical works or activities does not include any facilities associated with either upstream or downstream facilities as these are outside the scope of the Project assessed under NEB Act or CEA Act.

With respect to the consideration of cumulative effects under the CEA Act, Keystone contended that this requires an assessment of the potential for the residual effects of the Project to combine or overlap with the effects of past, present or planned projects. Keystone stated that an inclusion list was developed to identify the existing and future projects that would overlap with the potential effects of this project, as described in section 8.5 of the ESR. In addition, the past projects were captured within the baseline conditions assessed for the Project.

In addition, Keystone stated that the development of the oil sands is subject to a separate regulatory review process which presumably considers the effects of their development, including greenhouse gas emissions.

With respect to the GHG emissions from the Project itself, Keystone acknowledged that it did not conduct any modeling or quantitative assessment to generate hard numbers and the assessment was solely based on professional judgment and its past experience with other pipeline projects.

Keystone submitted that the GHG emissions from the Project are minimal as compared to provincial or national inventories. Keystone argued that the Project will not emit any GHG emissions other than those from pipeline construction related to construction equipment.

Keystone stated that the ESA did not consider any emerging climate change policies or programs that would limit the oil supply and demand and hence, the potential for early decommissioning. Keystone speculated that its shippers may have considered climate change policy scenarios in evaluating the Project.

Views of the Board

The Board notes the evolving and increased public awareness and demand for information around the issue of climate change and GHG emissions. As part of its public interest mandate, the Board in this instance chose to allow SCC's line of questioning as to the nature of the relationship

between the Keystone XL project and other projects or activities with environmental impacts.

The facts before the Board established that the Keystone XL Pipeline commences at the Hardisty, AB hub, which receives various types of oil from numerous upstream sources (Figure 3.2). The Applicant is not applying to produce or supply the product it proposes to ship. Further, the upstream facilities are or will be regulated by other governments and operated by numerous corporate entities. Similar circumstances apply downstream where the project could deliver crudes to several refineries, in Texas and Louisiana

After considering the evidence, the Board is not convinced that there are sufficient grounds for it to include a consideration of the upstream or downstream facilities either under the CEA Act or NEB Act.

Considerations under the CEA Act

While the CEA Act does not provide specific direction for determining which physical works should or should not be included within the scope of a project, it is common practice that the scope of a project under the CEA Act include only those physical undertakings that are applied for by the proponent or are likely to be carried out in relation to the proposed physical work. This includes the Project's construction, operation and abandonment as well as any ancillary or subsidiary undertakings.

Based on the factual points noted above, the Board determined that there were no other physical works that were of sufficient relation to the Project to be included in the scope. The upstream and downstream facilities mentioned by SCC are not part of the applied-for project, are not undertakings that will be carried out by the Proponent in relation to the Project and are not directly related to the Project. As a result the Board was of the view that they were not properly part of the scope of the project or the scope of the environmental assessment⁴. Moreover, there is nothing in the CEA Act to suggest that it is within the intent or ambit of that Act for a project-specific EA to require a broad assessment of a whole industrial sector even if aspects of it are indirectly related to the project in some fashion.

Under the CEA Act the Board examines the environmental effects of the project and the cumulative effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out. The Board may consider specific effects from other projects or activities, to the extent that they interact cumulatively with the effects of the Project. The Board notes that this necessarily requires a

4 Refer to the Scope of the Environmental Assessment, attached to the ESR in Appendix IV of these Reasons

measurable or demonstrable residual effect, from both the primary project as scoped as well as from the other projects or activities being considered, and there must be an interaction or overlap between the effects. The Board is of the view that the spatial extent of Project effects on air quality, water, wetlands, habitat fragmentation, biodiversity, wildlife, and other socio-economic elements is not widespread enough to interact with or meaningfully cumulate with effects from upstream or downstream projects or activities. As for cumulative effects related to climate change the Board notes the distinction between emissions and potential climate change effects resulting from emissions. The Board is of the view that in this case, while there may be minor residual emissions, these are likely not sufficient enough to meaningfully contribute to the appropriate provincial or national inventories from which climate change effects may begin to be assessed.

NEB Act Considerations

The Board has on numerous occasions stated that its mandate under the NEB Act includes a consideration of the environmental and socio-economic impacts of a project as part of its consideration of whether the project is in the public convenience and necessity. When the Board is asked to consider the impacts of upstream or downstream facilities that are somewhat related to but not part of the project under consideration, the Board looks to see if there is a nexus, or direct connection, between the upstream or downstream facilities and the applied-for project.

In the Board's view there is no evidence of a connection or nexus between the applied-for project and other projects or activities which would make emissions from upstream activities relevant to the Board's considerations in this Application. The operation of the upstream facilities is not contingent on the construction of the Keystone XL pipeline; they will presumably continue to operate whether or not KXL is ever built. Further, an examination of the effects of these activities will not inform the Board's decision under section 52 of the NEB Act and will not assist the Board in determining if the Application is in the public convenience and necessity. Similarly, the Board considers that the downstream refining and use of the oil products shipped on the Project is too remote and not relevant to its consideration of whether this project is in the public convenience and necessity.

With regard to SCC's claim that Keystone failed to inventory, model and quantify GHGs from the Project, the Board is not persuaded that this means that GHG emissions from the Project would be of material importance. However, being mindful of transparency, accountability and public concern, the Board believes it appropriate, and that it would be advantageous, for Keystone to quantify its Project GHG emissions and

confirm the assumption of negligible emission volumes and rates. To this end the Board has chosen to impose condition 15.

With respect to questions raised by SCC concerning emerging climate change policies that could affect supply and demand and so the need for, or early decommissioning of, the pipeline, the Board notes that there is no evidence to demonstrate how or why such a scenario would necessarily result in early decommissioning or how likely this may be. Consequently the Board is of the view this is more speculative than likely.

10.3 Socio-Economic Matters

The Board expects companies to identify and consider the impacts projects may have on socio-economic conditions including the mitigation of negative impacts and the enhancement of project benefits.

Potential socio-economic effects covered by the CEA Act are included in the ESR. The CEA Act contemplates indirect socio-economic effects caused by a change to the environment as a result of the Project. Direct socio-economic effects caused by the existence of the Project itself are assessed under the NEB Act and are discussed below.

10.3.1 Infrastructure and Services

Keystone indicated that there may be insufficient accommodations for pipeline construction workers in certain areas, particularly in areas within Saskatchewan.

Keystone stated that the responsibility for worker accommodations will reside with the various contractors who will be performing work on the Project. As part of the tender process, prospective contractors will be requested to provide their plans to house workers for Keystone's review and approval, which may include the use of construction camps. Where technically and economically feasible, such camps will be located at sites previously used for similar purposes, such as those previously used in Oyen, Alberta for the Base Keystone project and in Shaunavon, Saskatchewan for Foothills.

Preliminary project plans for the Keystone XL anticipate the installation of a sleeper type camp, in the towns of Oyen, Alberta (or area) and in Shaunavon, Saskatchewan (or area). A sleeper camp provides for worker sleeping accommodation (i.e. like a motel) complete with washroom/shower facilities, but not for kitchen facilities. This is a similar arrangement to that which is currently being used in Oyen for the Base Keystone project.

Keystone indicated that preliminary discussions with representatives from the Town of Oyen and the Town of Shaunavon have indicated a positive response to hosting temporary construction camp and a desire to work closely with Keystone and its contractors as details of the requirements for camp type accommodations become better defined (e.g. timing, location, size of camp, number of workers). Both the Town of Oyen and the Town of Shaunavon have offered suggestions of possible suitable sites for the location of a temporary camp on municipal property.

Keystone has committed that all applicable municipal and provincial government approvals for the installation and operation of any temporary construction camp will be acquired prior to use. Furthermore, Keystone or its contractors will clearly define rules, consequences, security protocols and other expectations of workers using the camps.

Keystone indicated that while the temporary nature and relatively short duration of pipeline construction will not have significant long term effect on the communities, the short-term impact of increasing the accommodation and food service utilization of the communities and maximizing the benefits to the local economy will be positive.

Views of the Parties

No party to the proceedings raised concerns, nor were any comments received with respect to the impacts to infrastructure and services from the Project.

10.3.2 Employment and Economy

Keystone submitted that the total direct and indirect jobs created during construction of the facilities would amount to approximately 5310 person-months of employment and an estimated CDN\$58 million in wages and salaries. Additional property taxes, amounting to an estimated CDN\$8 million, will be paid each year to municipalities in which the pipeline and Hardisty B terminal are located.

Views of the Parties

The AFL and the CEP expressed concerns about the missed opportunities for job creation locally, regionally and nationally due to the lack of value-added processing of oil products to be shipped on the Keystone XL pipeline. This issue is discussed in Chapter 4.

Views of the Board

The Board finds that the socio-economic impacts of the Keystone XL Project will be of a temporary nature and limited to the relatively short duration of pipeline construction without significant long term effect on the surrounding communities. The Board notes Keystone's evidence that directly affected towns have indicated a positive response to hosting temporary construction camps and that there was no contradicting evidence that the short term impact of increasing the accommodation and food service utilization of the communities would be positive to local economies. As to AFL and CEP's concerns with respect to foregone job opportunities in the refining and upgrading industries, the Board's views on this matter are given in Chapter 4 of these Reasons.

Chapter 11

The Board's Public Interest Determination

11.1 The Canadian Public Interest

The Board promotes safety and security, environmental protection and efficient energy infrastructure in the Canadian public interest in its regulation of pipelines, international power lines and energy development. With respect to the Keystone XL application, it is the role of the Board to determine if the Project is in the public convenience and necessity pursuant to section 52 of the Act.

In making this determination the Board has regard to all considerations that appear to it to be relevant, including any public interest that may be affected by the granting or the refusing of the application. The Act provides the Board with flexibility and broad powers, but the Board must interpret and implement the Act in ways that serve the Canadian public interest.

All issues and concerns before the Board were considered in the context of the entire lifecycle of the Project (i.e., design, planning, construction, operation, decommissioning and abandonment).

The Board has described the public interest in the following terms:

The public interest is inclusive of all Canadians and refers to a balance of economic, environmental and social interests that change as society's values and preferences evolve over time. As a regulator, the Board must estimate the overall public good a project may create and its potential negative aspects, weigh its various impacts, and make a decision.⁵

Under the NEB Act, the factors to be considered and the criteria to be applied in coming to a decision on whether a project is in the present and future public convenience and necessity may vary with the specific application, including the nature of the proposed project, its location, the commodity involved, the various segments of the public affected by the decision, and the purpose of the applicable section of the NEB Act.

When applying the “present and future public convenience and necessity” test under Part III of the NEB Act, the Board is required to identify and weigh all relevant evidence on the record and come to a determination whether the project is in the public interest and the present and future public convenience and necessity. There are typically both benefits and burdens associated with each application and the Board must apply its reasoned judgment, based upon a considered analysis of the evidence properly before it, to come to its final determination.

Section 11.2 provides the Board's assessment of the overall benefits and burdens of the Keystone XL Pipeline in relation to its decision under section 52 of the NEB Act.

5 GH-1-2006 Reasons for Decision dated May 2007, Chapter 2, page 10.

11.2 Weighing of Benefits and Burdens of the Keystone XL Pipeline

Benefits

In the Board's view, the economic benefits of the Keystone XL Pipeline are derived mainly from increased competition and additional transportation options for shippers. The Board is satisfied that the Project will help ensure that adequate capacity exists to connect growing WCSB supply to the large USGC market which the Board views as a large, long-term and strategic market for western Canadian crude oil. In this regard, the Keystone XL Pipeline will help ensure that all producers realize netbacks that reflect the full market value of their production. Canadian crude oil netbacks provide revenues to governments and to industry to make social and economic investments. In the Board's view, these investments benefit all Canadians.

By opening new markets for Canadian crude oil, the Board is of the view that the Keystone XL Pipeline would alleviate the economic risk associated with saturation in existing markets. The significant financial commitments made by shippers through binding agreements to ship 60 300 m³/d (380 Mb/d) of crude oil for an average of 17 years indicate to the Board that the USGC will prove to be a profitable long-term market for Canadian crude oil.

Burdens

While the Board agrees with Keystone's assessment that no excess pipeline capacity currently exists before connecting western Canada and the USGC, it was demonstrated during the proceeding that if this Application is approved there may, for some time, be physical excess pipeline capacity for western Canadian crude oil exports. During the proceeding, the Board heard evidence that existing pipelines may experience some degree of offloading for a period of time and shippers on these systems could potentially incur higher tolls as a result. This, could potentially include a period of lower netbacks to producers in the short term. Consequently, the Board is of the view that the economic burdens of the Project concern mainly the costs to commercial third parties.

Secondly, under the CEA Act, the Board concluded that the Project is not likely to cause significant adverse environmental effects; however, there will still be some physical effects and the Board considered these under the NEB Act. The Board notes that there will be some increase in ambient noise levels from pump station operations, air emissions generated from various components of the construction and operation of the Project, a potential loss or alteration of some wildlife and wildlife habitat and impacts on vegetation along the RoW. Finally, the Board notes that a project of this nature will have an impact on landowners and those with interests in the land on the RoW, particularly during the construction phase.

Balancing of Benefits and Burdens

In weighing the benefits and burdens for this Project, the Board has determined that the benefits of the Keystone XL Pipeline outweigh the burdens. Most western Canadian producers are likely to benefit from the Keystone XL Pipeline in the long run through broader market access, greater customer choice and efficiencies gained through competition among pipelines. On the other hand, there may be physical excess pipeline capacity for western Canadian crude oil exports for

some time and shippers on these systems could potentially incur higher tolls as a result. In that regard, the Board has no cogent evidence before it demonstrating that these potential costs resulting from unutilized capacity would be unmanageable by sophisticated industry parties. The Board also notes that Alberta oil sands are a substantial resource base capable of delivering long term, significant supply growth. Consequently, the Board is of the view that western Canada pipeline utilization overall is likely to increase over time.

The Board is of the view that the public interest will be best served in this case if competitive forces are permitted to function. In making its public interest determination, the Board must balance potential negative short term market adjustments with the longer term benefits that the Keystone XL Pipeline is expected to provide. On balance, from an economic perspective, the Board has concluded that the long term benefits of this Project outweigh the burdens identified in the short run because pipeline facilities are, by their very nature, long term infrastructure.

As for the other burdens identified above, the Board notes that energy infrastructure will usually have some impact on some individuals who use the land on or near where the facilities are located; the Board has weighed these impacts in this application. The Board notes that by using a RoW that is contiguous to existing rights of way Keystone will be able to minimize any further increase in overall landscape fragmentation. Also, the Board notes that the certificate conditions outlined in Appendix III, as well as the commitments made by Keystone XL, will serve to minimize the physical impacts of the Project to the extent possible.

After considering all of the evidence, and identifying and weighing the benefits and burdens of the Project, the Board has concluded that, on balance, the benefits of the Keystone XL Pipeline outweigh its burdens. As a result, the Board has come to the conclusion that the Keystone XL Pipeline is in the public interest and is and will be required for the present and future public convenience and necessity.

11.3 Acknowledgements

The Board would like to acknowledge the participation of all parties in the hearing associated with this application. The Board is committed to ensuring that all stakeholders are engaged effectively in the Board's public process. One aspect of this commitment is to have effective public participation in oral hearings before the Board.

In this proceeding, there was a high level of participation by individuals and groups who may not have previously appeared in front of a quasi-judicial tribunal. The time and effort that these parties spent to meaningfully participate in the public hearing was noted, and through their participation, the Board collected evidence that was highly relevant to its deliberations.

Appendix I

List of Issues

In Hearing Order OH-1-2009, the Board identified but did not limit itself to the following issues for discussion in the proceeding:

1. The need for the proposed facilities.
2. The economic feasibility of the proposed facilities.
3. The potential commercial impacts of the proposed project.
4. The potential environmental and socio-economic effects of the proposed facilities, including those to be considered under the *Canadian Environmental Assessment Act* (the Scope of which is set out in Appendix IV).
5. The appropriateness of the general route of the pipeline.
6. The method of toll and tariff regulation.
7. The suitability of the design of the proposed facilities.
8. The terms and conditions to be included in any approval the Board may issue.
9. Potential impacts of the project on Aboriginal interests.

Appendix II

Significant Rulings

19 June 2009	Board Ruling on Changes to the List of Issues and Scope of the Environmental Assessment
8 September 2009	Board Ruling on RATH & COMPANY Request to Cross-examine Government Participants and Individuals
8 September 2009	Board Ruling on Sierra Club Canada Letter dated 2 September 2009 Seeking Permission to Make an Opening Statement
9 September 2009	Board Ruling on RATH & COMPANY Letter dated 3 September 2009 Giving Notice of a Preliminary Matter
10 September 2009	Board Ruling on RATH & COMPANY Request to Cross-examine Government Departments
14 September 2009	Board Ruling on Requirements to File Contracts which were asked pursuant to National Energy Board Information Request No. 4 (IR No. 4)
18 September 2009	Board Ruling on Motion by the Sweetgrass First Nation (SFN) and Moosomin First Nation (MFN)

Board Decision on Changes to the List of Issues and Scope of the Environmental Assessment

List of Parties

Pursuant to Paragraph 11 of Hearing Order OH-1-2009 dated 12 May 2009, please find attached the List of Parties.

The application for Intervenor Status by Indigenous Environmental Network was rejected as it was filed by email (contrary to paragraph 15 of Hearing Order OH-1-2009) and no description of interest in the project was given.

Applications for Intervenor Status from the Sweetgrass First Nation, the Moosomin First Nation, Sierra Club and the Communications Energy and Paperworkers Union of Canada (CEP) were received after the deadline imposed by the Hearing Order. However, the National Energy Board has decided to grant these applications since doing so could not be expected to cause prejudice to other parties, including the applicant, at this point in the process.

List of Issues

Submissions on the List of Issues were received from Dale and Shirley McInnes (McInnes), the CEP, Sierra Club Canada (Sierra) and Transport Canada.

The Board has considered the concern raised in the submission by the McInnes with respect to the List of Issues, which concern is the design and location of Pump Stations. The Board is of the view that, to the extent relevant, that issue is already captured in Issues 4 and 7.

CEP requested that the issue “Is the establishment of this pipeline project consistent with the goals of i) ensuring Canadian energy security, ii) promoting sustainable economic development of Canada's energy economy, and iii) meeting Canada's obligations to reduce greenhouse gas” be added to the list.

The Board is of the view that, to the extent relevant, ensuring Canadian energy security is already captured in Issue 3 such that no addition to the List of Issues is required.

The Board is of the view that the second issue raised by CEP, promoting sustainable economic development of Canada's energy economy, would be captured by Issues 2 and 4 to the extent relevant. Further the Board is of the view that the List of Issues is broad enough to encompass matters pertaining to development of energy economy, to the extent that such matters are relevant to the determination the Board has been called upon to make. In any event, the Board is charged with considering the application as it has been framed by the applicant.

The Board is of the view that CEP's third issue, meeting Canada's obligations to reduce greenhouse gas emissions, to the extent that greenhouse gas emissions are relevant, are already captured by Issue 4. In determining the relevance of those effects, the Board will consider whether there is a sufficient connection between those effects and the determination it must make pursuant to section 52 of the National Energy Board Act.

Sierra proposed changing Issue 1 to read (their change in italics) “The need for and alternatives to the proposed facilities”. The Board notes that the Draft Scope of the Environment Assessment (EA) under 2.2 Factors to be Considered states that the EA will include a consideration of the factors listed in paragraphs 16(1) (a) to (d) of the Canadian Environmental Assessment Act (CEA Act). A decision was made by the Responsible Authorities in consultation with the Federal Authorities not to include a consideration of alternatives to the project. Further, Sierra’s discussion of alternatives appears to bear on broader policy questions of energy supply and development that are beyond the jurisdiction of the NEB and separate from the proposed Keystone XL pipeline project that is about energy transportation. The Board is therefore of the view that the List of Issues does not need to be changed in this regard.

Sierra also requested that Issue 4 be changed to read (their proposal in italics) “The potential cumulative environmental and socio-economic effects ...” etc. The Board notes that cumulative impacts are included under paragraph 16(1) (a) of the CEA Act and, to the extent that they are relevant, will be considered pursuant to Issue 4. In determining the relevance of upstream and downstream effects, the Board will consider whether there is a sufficient connection between those effects and the determination it must make pursuant to section 52 of the National Energy Board Act.

Transport Canada (TC) requested that the Board add the following to the list of issues:

“Aboriginal concerns with respect to the Project related to potential adverse impacts to potential or established Aboriginal or treaty rights”.

The Board considers the potential impacts of the Project on Aboriginal interests as part of its overall public interest consideration. However, after considering TC's request, the Board is of the view that adding the issue: "Potential impacts of the project on Aboriginal interests" to the List of Issues will make it clearer to the parties to the hearing and the Responsible Authorities that this issue will be specifically considered by the Board. Therefore, the Board has decided to amend the List of Issues (attached) to include the issue of "Potential impacts of the project on Aboriginal interests".

For further information in this regard, please see the NEB document entitled Consideration of Aboriginal Concerns in National Energy Board Decisions available on the NEB’s website.

Therefore the Board has determined that one addition to the List of Issues contained in the Hearing Order is required as noted above. The List of Issues is used to help focus the examination of a project. While the Board is not limited to those issues specifically delineated in that list, it will only consider matters that are in its view relevant to its assessment of the application.

Scope

Transport Canada in their letter of 9 June 2009 made comments as follows on the Scope of the EA:

As amendments have recently been made to the *Navigable Waters Protect Act*, TC requests that the draft scope of environmental assessment be amended by changing the sentence in section 2.1

Scope of the Assessment which currently reads “For TC, based on section 108 of the NEB Act and section 5(1) of the *Navigable Waters Protection Act*..” to “For TC, based on section 108 of the NEB Act and the *Navigable Water Protection Act*...

The Board has agreed to make this amendment to the scope of the EA and post the amendment on the CEA registry.

CEP Request for Funds

CEP has asked that:

For this hearing to represent a meaningful opportunity for informed public participation, the costs of intervention by CEP and certain other interveners must be financially assisted, and we encourage the Board to establish the appropriate modalities for doing so.

The Board notes that the NEB Act does not provide the Board with the authority to provide funding to parties in section 52 of the NEB Act proceedings.

Total E & P Canada (Total)

Total originally sent a letter dated 3 June 2009 which appeared to be asking the Board that it be considered as an intervenor. Subsequently Total supplied the Application for Intervenor form and also supplied a letter, both dated 9 June 2009. The letter requested that the Board strike the 3 June 2009 letter from the record. Since this request is made by the person who filed the letter, the Board agrees to the request.

Parties are to advise the Secretary of any change in their contact information. The List of Parties will be amended for any such changes. On receipt of this List of Parties, Intervenors are to serve all other Intervenors to the hearing, their written interventions pursuant to paragraph 11 of the Hearing Order. Government Participants are to serve their declarations on all parties pursuant to paragraph 11 of the hearing Order. Please note that the deadline for filing and serving materials is 12:00 noon, Calgary Time, unless otherwise noted in Hearing Order OH-1-2009.

Board Ruling on RATH & COMPANY Request to Cross-examine Government Participants and Individuals

The National Energy Board notes the RATH & COMPANY letter dated 3 September 2009 whereby counsel, on behalf of the Sweetgrass and Moosomin First Nations, has made a number of requests, including a request for cross-examination of GP.

As an Intervenor, you need not seek the permission of the Board to cross-examine the applicant or other Intervenors who have filed evidence; it is your right to do so. As such, you are free to ask questions of any of Keystone’s three witness panels. It is up to Keystone to identify who will be the witnesses on its panels. Unless Ms. Swanson and Ms. Menzies agree to your request, you have not shown how their testimony would be material or relevant to the proceeding. Therefore, the Board is not compelling these two individuals to appear.

The Alberta Department of Energy and the Saskatchewan Ministry of Energy Resources are registered as Intervenors, not Government Participants, and therefore you would not require leave of the Board to cross-examine either party. However, neither party has filed evidence such that there is nothing for them to be cross-examined on. Again, unless Mr. Huk, Ms. Page and Mr. Rymes agree to your request, you have not shown how their testimony would be material or relevant to the proceeding. Therefore, the Board is not compelling these three individuals to appear.

With respect to the Major Projects Management Office (MPMO), Natural Resources Canada (NRCan), and Transport Canada (TC), these parties are GPs, and you do need the Board's permission to cross-examine them, but only NRCan and MPMO have filed evidence. The Board will therefore consider your request only as it pertains to MPMO and NRCan. The Hearing Order provides that these GPs have until 8 September 2009 to reply to your request and that you will then have until 11 September 2009 to reply. The Board will then decide and if granted, may impose restrictions on the scope of questions that may be allowed to ensure their relevancy to the decision the Board is asked to make in this case. The Board would note however, that if the request is granted, these GPs can choose which location (Calgary or Saskatoon) they want to appear to adopt their pre-filed evidence and allow for questions on it. They can also select who their witnesses will be to speak to their written evidence. Unless Mr. Skocylas, Mr. Clausen, Ms. LeMay and Ms. Foy agree to your request, not having shown how their individual testimony would be material or relevant to this proceeding, the Board is not compelling them to appear. As for TC, since TC did not file evidence, the Board notes that there is nothing for TC to be cross-examined on. Again, unless Ms. Mai-Linh Huynh agrees to your request, you have not shown how her testimony would be material or relevant to the proceeding. Therefore, the Board is not compelling this individual to appear.

Should MPMO and NRCAN accept, and if the Board grants the request, the Board would be appreciative if they could indicate where they intend to appear (Calgary or Saskatoon) in their response.

Oral Ruling from 21 September 2009, Hearing Transcript Volume 5, lines 5471-5477:

Ruling number one; the request of Rath & Company on behalf of the Sweetgrass and Moosomin First Nations to cross-examine government participants in OH-1-2009 proceeding.

On September 3rd, 2009, Rath & Company, on behalf of the Sweetgrass and Moosomin First Nations, sought leave of the Board to cross-examine the Major Projects Management Office and PMO and Natural Resources Canada, NRCan, who are government participants in this proceeding.

The Board notes that only Rath & Company has sought leave to cross-examine these government participants. The Board's decision on this request is as follows:

Given that Rath & Company has not entered an appearance for the Sweetgrass and Moosomin First Nations in the oral hearing such that the Board has no assurance that Rath & Company would appear when called upon to cross-examine the government participants, and the fact that Rath & Company did not avail itself of the opportunity to reply to the MPMO and NRCan

responses to the Rath & Company request to cross-examine them, while the MPMO and NRCan did provide a response to the request by the requested deadline of September 10th, 2009, Rath & Company did not offer a reply although it had until the 15th of September to provide one and Rath & Company did not seek subpoenas.

Since the Board was not clear if Rath & Company was seeking subpoenas, the Board issued a letter on the 10th of September, 2009 outlining what additional information would be required of Rath & Company for the purposes of requesting a subpoena. However, no such additional information was filed and no formal subpoena request was made.

The request is denied.

The MPMO and NRCan do not have to appear at the oral hearing for the purpose of being cross-examined by Rath & Company on their pre-filed evidence. However, MPMO and NRCan are reminded that they must still adopt their written evidence and the Board grants the MPMO and NRCan leave to adopt their evidence by written affidavit.

Board Decision on Sierra Club Canada Letter dated 2 September 2009 Seeking Permission To Make an Opening Statement

The National Energy Board notes the Sierra Club Canada (Sierra) letter dated 2 September 2009 whereby Sierra asks leave to make an opening statement regarding the possibility of amending the List of Issues.

The Board recalls that in Sierra's intervention, Sierra sought to have certain issues included on the List of Issues. By letter dated 2 September 2009, Sierra indicates that it would want to raise, as a preliminary matter, the request that the List of Issues be amended to include the same issues it had asked for in its intervention, namely:

1. The Need for and Alternatives To the proposed facilities (*italics used to show the proposed addition*); and
2. The potential cumulative environmental and socio-economic effects of the proposed facilities (*italics used to show the proposed addition*).

As the Board explained in its letter of 19 June 2009, Alternatives To the proposed facilities were not included in the scope of the Environmental Assessment (EA) to be conducted. Moreover, it was observed that the Alternatives To contemplated by Sierra appeared to be related to policy surrounding the development of alternatives to non renewable sources of energy, which in the Board's view is a matter outside its mandate. While Alternatives To are not included in the scope of the EA, it should be noted that a decision denying the application or "no project", which is always a possibility, is essentially an Alternative To. Sierra is also free to explore the issue of Need for the project.

As further explained in the Board's letter of 19 June 2009, cumulative effects are already included in the List of Issues and will be considered by the Board to the extent that they are relevant.

The Board would therefore not amend its List of Issues as Sierra would want it to. Therefore, to the extent that Sierra's preliminary matter has been substantively addressed by this response, the Board denies Sierra's request to make an opening statement regarding the amendment of the List of Issues, as detailed herein. If Sierra has other, different, preliminary matters to bring to the attention of the Board, Sierra can of course raise them with the Board.

Board Decision on RATH & COMPANY Letter dated 3 September 2009 Giving Notice of a Preliminary Matter

The National Energy Board is in receipt of the RATH & COMPANY (Rath and Co.) letter dated 3 September 2009 whereby counsel, on behalf of the Sweetgrass and Moosomin First Nations, informed the National Energy Board (Board or NEB) of its intention of raising a preliminary matter at the start of the hearing to the effect of seeking leave to adjourn the OH-1-2009 hearing pending the fulfillment of meaningful consultation between the Federal and Provincial Crown with the Sweetgrass and Moosomin First Nations.

The Board will treat this preliminary matter as a motion pursuant to section 35 of the National Energy Board Rules of Practice and Procedure, 1995 and the Board has decided that it will be addressed by way of a written process. This process is as follows:

1. Rath and Co. must file their submissions in chief with the Board in writing by noon (Calgary time) on 11 September, 2009 and serve a copy of it on all other parties. The submission should contain a concise statement of facts, the relief sought and the grounds for it, and as appropriate, the legal authorities on which the motion is grounded on.
2. Any party wishing to answer the motion must file a written answer with the Board by noon (Calgary time) on 15 September 2009 and serve a copy of it on all other parties (including Rath and Co.).
3. Rath and Co. may then reply and any reply must be filed with the Board in writing by 17:00 pm (Calgary time) on 16 September 2009 and a copy of it served on all other parties.
4. The Board will issue a decision on the motion shortly after. In any event, the Board will issue a decision on the motion prior to Keystone's witness panel 3 being called upon for cross-examination.

The Board reminds parties that "Parties" include the applicant, registered Intervenor and registered Government Participants (paragraph 11 of the OH-1-2009 Hearing Order).

The Board has considered whether this motion need be decided before the start of the hearing and has concluded that it does not. In particular, the Board is of the view that the prejudice that would accrue to parties who are prepared to proceed with the hearing outweighs the potential negative consequence, if any, to Rath and Co. and its clients, if the motion is successful. This is so, largely because the Board has decided to issue a decision on the motion prior to Keystone's panel 3 being called upon for cross-examination, which is the only Keystone panel that Rath and Co. has indicated it would have questions for. The Board notes that Rath and Co. has requested

to cross-examine other participants, but if these requests are granted, the cross-examination of these participants would all follow Keystone's presentation of its case and would be subsequent to Keystone's panel 3 being released.

In light of the fast approaching start of the hearing and the desire of the Board to issue a decision as soon as possible, it is crucial that the deadlines prescribed above be strictly adhered to.

Board Decision on Rath & Company's Request to Cross-examine Government Departments

The National Energy Board notes Rath & Company's letter dated 3 September 2009 whereby counsel, on behalf of the Sweetgrass and Moosomin First Nations, has made a number of cross-examination requests.

The Board has already responded to a part of these requests in its letter dated 8 September 2009.

This letter seeks to respond to the part of your letter that sought leave to cross-examine certain government departments namely:

- INAC (specifically Mimi Fortier)
- Saskatchewan Ministry of First Nations and Métis Relations (specifically Seonaid MacPherson)
- Government of Alberta, Aboriginal Relations (specifically Graham Statt and Cory Enns)

As these government departments are not parties in this proceeding there is no automatic right to compel attendance for purposes of cross-examination.

As you already know, in limited circumstances it is available to a party to request that the Board subpoena a particular witness or witnesses. The test the Board considers is whether entities were asked to produce particular witnesses and were refused as well as whether the evidence that could be provided by these witnesses is necessary or pertinent to the OH-1-2009 proceeding and that the information could not be obtained in any other matter or from any other source. The Board notes that compelling attendance for cross-examination is only granted in extenuating circumstances.

It is unclear to the Board whether a formal subpoena request has been made on behalf of your clients. If a subpoena request has been intended your request does not show how the testimony of witnesses on behalf of these government bodies would be necessary or pertinent to the OH-1-2009 proceeding or that the information that these individuals could provide could not be obtained in any other matter or from any other source. Your request also does not indicate that you have asked the parties to produce particular witnesses and were refused. If you have not yet but intend to proceed with a formal subpoena request, the Board requests that a Motion be made at the earliest possible date preferably in writing prior to the commencement of the Hearing on 15 September 2009.

This letter also seeks to respond to your remaining request seeking leave to cross-examine other parties and individuals in this proceeding:

- Major projects Management Office (MPMO), Natural Resources Canada (NRCan) (specifically Jim Clarke)
- Transport Canada (specifically Karmen Klarenbach)

With respect to MPMO and NRCan the Board previously outlined in its 8 September 2009 correspondence a process that is unfolding and will lead to a Board decision. If your request is granted, MPMO and NRCan will decide who they will present as their witnesses.

With respect to Transport Canada and Ms. Karmen Klarenbach, the Board reiterates its earlier advice that although Transport Canada is a party in these proceedings it has not filed evidence which precludes any automatic right of cross examination.

If it is your intention to seek a Board ordered subpoena with respect to specific witnesses from MPMO, NRCan or Transport Canada, the requirements by the Board are as outlined above.

Motion by the Sweetgrass First Nation (SFN) and Moosomin First Nation (MFN)

Rath & Company, counsel for SFN and MFN, advised the National Energy Board by letter dated 3 September 2009 that they intended to bring forward a preliminary matter at the commencement of the hearing on 15 September 2009 in which they would “seek leave to have the hearing adjourned pending the fulfillment of meaningful consultation between the federal and provincial Crown and our clients.”

On 9 September 2009 the Board issued a letter establishing a written process to deal with the Notice of Motion. In its letter the Board stated that it need not hear the motion prior to the start of the hearing. This was based on the determination that the prejudice that would accrue to parties prepared to proceed with the hearing outweighed any potential prejudice to SFN and MFN if the motion were successful. The Board indicated that it would render its decision on the motion prior to Keystone’s panel 3 being called upon for cross-examination since this was the only Keystone panel for which Rath & Company indicated it would have questions. The Board noted Rath & Company had requested to cross-examine other participants but determined that if these requests were granted, the cross-examination of these participants would all follow Keystone’s presentation of its case and would be subsequent to Keystone’s panel 3 being released.

Counsel for SFN and MFN was directed to file submissions with the Board on 11 September 2009. Parties wishing to respond to the motion were directed to file their written answers with the Board on 15 September 2009. Counsel for SFN and MFN had until the close of business on 16 September 2009 to file the reply, with the Board’s decision on the motion to be issued shortly thereafter, or in any event, prior to Keystone’s witness panel 3 being called upon for cross-examination.

On 11 September 2009, SFN and MFN filed a written Notice of Motion requesting an order from the Board that includes the following relief:

- a) a Declaration that the NEB does not have the jurisdiction to issue a section 52 Certificate until meaningful consultation has occurred among the federal and provincial Crowns and the SFN and MFN;
- b) an adjournment of NEB hearing OH-1-2009 pending the fulfillment of meaningful consultation among the federal and provincial Crown and the SFN and MFN; and
- c) a Declaration clarifying the role of the NEB as either an agent of the Crown, delegated with the duty to consult, or a tribunal tasked with assessing the adequacy of the Crown's duty to consult.

Submissions on the Motion

Duty to Consult and Procedural Fairness and Role of the NEB

SFN and MFN

SFN and MFN submit that the Crown owes them a duty to consult and has not fulfilled that duty by relying on the NEB process. SFN and MFN assert they have inherent Aboriginal and treaty rights in their traditional lands and treaty territories and that the Crown is aware of these rights. Even if the scope and content of the Crown's duty to consult is at the low end of the spectrum it still requires direct engagement among federal and provincial Crowns and SFN and MFN.

SFN and MFN submit that their Aboriginal and treaty rights will be adversely affected by the proposed pipeline and that the evidence of specific adverse effects should be discussed through meaningful consultation with the Crown, not through a public hearing process. The procedure followed by the NEB does not readily recognize or accommodate the distinguished rights of First Nations. The government may not simply adopt an unstructured discretionary administrative regime which risks infringing Aboriginal rights. The NEB process has given no priority to date to the rights of SFN and MFN; SFN and MFN's constitutionally protected rights and interests must be given greater priority than those of a mere applicant for a certificate of public convenience and necessity.

In addition, SFN and MFN submit that the NEB has failed to clarify its role as it relates to the duty to consult. Great legal uncertainty exists surrounding the NEB's jurisdiction and the adjournment is required in order for these matters to be clarified by the Federal Court Trial Division. If the NEB is discharging the duty to consult as a delegated authority it is required to uphold the honour of the Crown and act in the best interests of SFN and MFN. These requirements cannot be fulfilled as the principles of natural justice require that the NEB, as a quasi-judicial tribunal, must maintain impartiality. Alternatively, if the role of the NEB is to assess the adequacy of consultation then this is a preliminary issue that must be addressed prior to deciding whether to issue the section 52 certificate.

TransCanada Keystone (Keystone)

Keystone requests that the relief sought by the Applicants be denied. It argues that the NEB has limited jurisdiction to consider claims of Aboriginal rights and title, and no jurisdiction to

consider the adequacy of Crown consultation. Further, it submits that the MPMO has indicated the Crown's duty to consult has been or will be met in the circumstances, to the extent possible, through the oversight role of the MPMO in the proceeding.

Keystone further submits that the requested declaration clarifying the NEB's role is unnecessary since the NEB confirmed its role is that of a quasi-judicial body at arm's length from the Crown.

NEB decisions confirm the NEB's position that it does not have the jurisdiction to deal with claims of Aboriginal rights and title. The NEB may only determine, within the scope of its hearing process, whether there has been proper consultation and engagement of Aboriginal groups by the project proponent having regard to the NEB's filing requirements. The fact that the Crown may or may not have met its duty to consult is a factor that is independent of an application for a certificate of public convenience and necessity.

Keystone submits that the NEB process, as it relates to potentially affected Aboriginal groups, provides, among other things, notice, disclosure of information and the opportunity to raise concerns. Keystone asserts that to date, the Applicants have actively participated in the information response process, have filed detailed written evidence and will be entitled to present evidence and conduct cross-examination during the oral hearing.

Keystone XL Shippers Group (KSG)

KSG opposes the motion as well. KSG submits that the proposition that all Crown consultation must take place prior to the commencement of the oral hearing phase of the Board's proceeding is not supported in law. The opportunity to participate in and the evidentiary record arising from administrative tribunal proceedings are an entirely appropriate means that the Crown may use to honourably discharge the duties it has under section 35(1) of the *Constitution Act*. No facts are cited in the Motion that in any way support the view that the National Energy Board is or will be acting for the Crown during the proceeding for the purposes of fulfilling all of the Crown's duties under section 35(1) of the *Constitution Act*. It is entirely appropriate for the Crown to employ the processes of a regulatory proceeding as one means to fulfill the duties owed pursuant to section 35(1) of the *Constitution Act*. Before issuing the applied-for certificate of public convenience and necessity, the GIC will consider whether or not additional consultation and/or accommodation are still necessary.

Major Projects Management Office (MPMO)

The MPMO takes no position in respect of the disposition of the motion but submits that the Federal Court in *Brokenhead Ojibway Nation v. Canada*⁶ confirmed that the Board's processes may be sufficient to address Aboriginal concerns, subject to the Crown's overriding duty to consider the adequacy of consultation in any particular situation. MPMO argues that based on the current case law, the NEB has the authority and jurisdiction to render a decision prior to the completion of any potential duty to consult.

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Reply Submissions of SFN and MFN

In reply to Keystone's answer, SFN and MFN submit the MPMO has unilaterally decided that the NEB is the appropriate forum to discharge its duty to consult. Moreover, the Crown has not attempted to consult outside the NEB process despite the Applicants' request.

SFN and MFN indicate that they expect to be consulted on the issues of:

- a) Treaty Land Entitlement (TLE);
- b) the impact of the Natural Resources Transfer Agreement of both Alberta and Saskatchewan; and
- c) the asserted right to be consulted with regard to the infringement of particular Treaty rights such as:
 - i) the right to hunt and trap and fish;
 - ii) the right to collect medicinal herbs;
 - iii) the right to traditional practices and to make use of sacred lands; and
 - iv) the right to continue the "usual vocations" of their forebears throughout their traditional and Treaty territories.

In specific reply to the case law relied upon by Keystone in its answer, SFN and MFN reiterated the ultimate responsibility for consultation rests with the Crown and that *Brokenhead Ojibway v. Canada*⁷ is an exception to the majority of the decisions on consultation and that as a matter of law, the NEB is not permitted to simply use the most recent court decision as a means of avoiding the overwhelming body of binding Canadian jurisprudence to justify ignoring their request for an adjournment prior to commencement of the hearing.

SFN and MFN argue they have participated in the NEB process to the extent necessary to ensure that the process is not thwarted, but this participation does not mean that the Crown has discharged its duty. The NEB is not a forum where the Crown's duty to consult may be fulfilled. The NEB process may provide a fair and reasonable opportunity for the public, but First Nations are not part of the public, but rather distinct and separate federally empowered entities whose rights and interests take priority over the public.

SFN and MFN submit that an assessment of whether adequate consultation has occurred prior to the GIC issuing the certificate of public convenience and necessity is too late in the process. The MPMO has full resources of federal departments available to identify all information necessary prior to the hearing in order that all possible mitigation measures are put before the NEB prior to a hearing so that the NEB can fairly assess consultation.

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Views of the Board

The primary assertion in the SFN and MFN motion is that the NEB hearing cannot proceed until a meaningful consultation process is completed between the Crown and the First Nations. Although it is not specified in the initial motion what the First Nations specifically expect to be included in a consultation process, in reply argument Mr. Rath submits that the consultations would deal with Treaty Land Entitlement; the impact of the Natural Resources Transfer Agreements of Alberta and Saskatchewan; and the asserted right to be consulted with regard to the infringement of particular treaty rights, such as the right to hunt, trap and fish, the right to collect medicinal herbs the right to traditional practices, and the right to continue the usual vocations throughout their traditional and treaty lands.

The NEB is a quasi-judicial decision-maker tasked with the responsibility to determine whether or not a proposed project is in the public interest. In weighing whether or not an application ought to be approved, the NEB has a broad mandate to consider all matters that appear to it to be relevant. As a federal tribunal with a broad mandate, the Board is of the view that its statutory discretion must be exercised in a manner consistent with the provisions of the Constitution, including section 35. The potential impact of a project on Aboriginal rights is a matter that is relevant to the Board's decision in virtually all cases where such impacts may occur. However, the fact that a project is to be constructed does not necessarily mean that it will have an actual impact on asserted or existing rights. That is an issue that has to be determined in each application, based on the specific facts. To ensure it has the information it needs, the Board requires proponents to provide evidence about Aboriginal groups that may be affected by the project, to enumerate the concerns that were raised and indicate how they were addressed. Aboriginal groups may or may not be satisfied with the proponent's process and so are encouraged to communicate their concerns to the Board so that those concerns may be considered in the decision-making process. The Board's process is designed to ensure that it has a full understanding of the concerns of Aboriginal peoples in respect of a project before it renders a decision.

The Board is governed by a variety of legislative and common law requirements and is a court of record that operates independently and at arm's length from the government of Canada. It is not the same thing as "the Crown" because it is an independent tribunal that is not subject to direction by the Crown. However, the Board was established by Parliament to independently carry out a number of roles that would otherwise fall to the Crown, including the regulatory review of pipeline applications. In respect of the Crown's Aboriginal consultation obligations, this legislative structure provides particular challenges not

faced by federal departments directed by Ministers of the Crown. In light of the specific legislative structure established in 1959 by Parliament under the NEB Act, the Crown has determined that it will rely on the NEB process as a means to meet some or all of its consultation obligations in respect of matters that fall within the mandate of the NEB. This does not mean that the Crown has delegated its duty to consult to the Board. The Board has jurisdiction to consider whether a project is in the public interest and as part of that consideration it weighs the costs and benefits of the project, including its potential effects on Aboriginal interests. Only the Board, and not some other Crown agency or department, has the ability to determine whether or not a project is in the public convenience and necessity. A Crown consultation process, such as that proposed by Mr. Rath in his motion, would ignore the fact that it is the NEB that decides whether to recommend to the GIC that the project should proceed and if so, under what conditions.

Because the Board is a quasi-judicial tribunal it cannot engage in off the record discussions with Aboriginals. Instead, it must rely on the open public hearing process to ensure it has the best possible evidence of the potential effects of a project on Aboriginal interests so that it may factor that evidence into its decision. By requiring proponents to engage in consultations directly with Aboriginal communities, ensuring that the hearing process is accessible to Aboriginals in as many ways as possible, and making certain that hearings are fair, open and transparent, the Board endeavours to get the best possible evidence of the potential impacts of the project on Aboriginals onto its record before making a decision. In order for Aboriginal groups to have their concerns considered by the Board it is incumbent on them to communicate those concerns to the Board, either through the proponent or directly through one of the various means of hearing participation available to them. Such communications should be specific to the potential effects of the proposed project rather than simply assertions that they have rights within the project area.

The appropriateness of the Board's process for the consideration of project impacts on Aboriginals was examined by the Federal Court in *Brokenhead Ojibway* wherein the Court stated:

Treaty One First Nations maintain that there must always be an overarching consultation regardless of the validity of the mitigation measures that emerge from a relevant regulatory review. This duty is said to exist notwithstanding the fact that Aboriginal communities have been given an unfettered opportunity to be heard. This assertion seems to me to represent an impoverished view of the consultation obligation because it would involve a repetitive and essentially pointless exercise. Except to the extent that Aboriginal concerns cannot be dealt with, the

appropriate place to deal with project-related matters is before the NEB and not in a collateral discussion with either the GIC or some arguably relevant ministry.⁸

Federal and provincial Crown agencies and departments may have certain permitting authority in respect of pipeline projects like Keystone; however, it is only the NEB that has the ability to decide whether or not to issue a certificate of public convenience and necessity, subject to GIC approval, and to impose conditions on the certificate. The NEB may deny an application or impose conditions on the certificate. Just as the Crown cannot direct the Board to do anything in particular due to the arm's length relationship, the Board does not have jurisdiction over the federal and provincial Crown or any particular Crown departments or agencies. It cannot direct them to consult, to consult differently or provide any particular accommodations. Crown agencies may need to carry out consultations with Aboriginals in respect of their own decision-making roles but it is not the responsibility of the Board to oversee such consultations.

Should SFN and MFN have concerns related to the project, the NEB is the appropriate forum to raise those concerns so that they may be considered by the Board before it reaches a decision on the application. However, as also noted by the Federal Court in *Brokenhead Ojibway*, the NEB regulatory process is not designed to address the larger issue of unresolved land claims or matters related to land entitlement. The Board notes that in his submission in response to the motion, Jim Clark, Director General, Operations for the Major Projects Management Office states:

The Federal Court has since confirmed that the Board's processes may be sufficient to address Aboriginal concerns, subject to the Crown's overriding duty to consider the adequacy of consultation in any particular situation. This is not a delegation of the Crown's duty to consult, but is one means by which the Crown may be satisfied Aboriginal concerns have been heard, and where appropriate, accommodated. Based on this current case law, the NEB has the authority and jurisdiction to render a decision prior to the completion of any potential duty to consult. As previously indicated in prior correspondence from the federal Crown to the SFN and MFN, the federal Crown is relying on the Board's process, to the extent possible, as the primary means of identifying, considering and addressing

8 *Brokenhead Ojibway*, *ibid* at para 35.

potential adverse project-related impacts on potential or established Aboriginal or treaty rights.⁹

The Board agrees with the MPMO's assertion that the NEB is not the overseer of the Crown's consultation efforts. Contrary to Mr. Rath's assertion, the MPMO submission is not stating that the NEB has delegated oversight of its process to the MPMO. The MPMO is simply stating that the Crown has opted to rely on the NEB process, to the extent possible, as a means of wholly or partially meeting its obligation to consult. Since the obligation to consult rests with the Crown as a whole, the Crown must determine the nature and extent of the obligation in any given situation. The Crown has indicated that it will, to the extent possible, rely on the Board's open public hearing process to determine, identify, consider and address potential project-related impacts. For its part, the Board has the obligation to consider the project in light of the potential impacts on existing or potential Aboriginal rights. The Board notes that the MPMO letter states that the Board may reach its decision prior to the "completion of any potential duty to consult". This suggests that the NEB decision is an important part of the consultation process in respect of pipeline applications, but it is possible that in certain circumstances the Crown may conclude that there is a need for additional consultation and accommodation in order for it to fulfill its obligation. The necessity for and timing of any such additional consultation is a matter for the Crown, not the NEB, to determine in each case.

Accordingly, it would make no sense to adjourn the present hearing since the NEB hearing process is the primary means of ensuring that Aboriginals' concerns about the project are identified, considered and addressed. If, after the conclusion of the hearing the Crown is of the view that additional consultation is required, it will no doubt take appropriate steps at that time. The Board therefore denies the request to adjourn the hearing.

For the foregoing reasons, the Board also denies the motion to issue a declaration that it does not have jurisdiction to issue a section 52 certificate. Finally, as the role of the Board in respect of Crown consultation is outlined above, the Board denies the request to issue a declaration clarifying its role in the terms specified in the SFN and MFN motion.

9 Filing A1L3G3, Exhibit D-3-8, 15 September 2009 Letter of Response to Motion from Natural Resources Canada, signed by Jim Clarke, Director General, Operations, MPMO.

Reasonable Apprehension of Bias

SFN and MFN

SFN and MFN allege that the Board's directions regarding the process for the hearing of the First Nations' preliminary matter as a motion in its letter dated 9 September 2009, create a reasonable apprehension of bias. The test, they assert, as defined by the case law is "what would an informed person, viewing the matter realistically and practically – and having thought the matter through – conclude? Would he think that it is more likely that not that [the decision maker], whether consciously or unconsciously, would not decide fairly?" SFN and MFN argue that by not deciding the preliminary matter before the hearing started, the Board has essentially ruled on the issue of adjournment prior to hearing the motion.

Keystone

Keystone expresses the view that the test for apprehension of bias was not met in the circumstances and that an argument to that effect is wholly without merit. Instead, it is of the opinion that the process adopted by the NEB to consider the motion would allow it to reach a fair decision in a timely manner, given the Board's undertaking to issue a decision prior to the commencement of cross-examination by counsel for the SFN and MFN.

KSG

KSG is also of the view that the circumstances do not give rise to a reasonable apprehension of bias. It argues that the Board's 9 September 2009 letter addressed the question of "when" the Board would decide the motion, not "how". In their view, the Board's balancing of the interests of all hearing participants in light of a late-breaking adjournment request did not constitute evidence that the SFN and MFN would be unable to obtain a fair hearing.

Views of the Board

Counsel for SFN and MFN first made the Board aware by letter dated 3 September 2009 that they intended to bring forward a preliminary matter at the commencement of the hearing on 15 September 2009. The letter stated: "...we will seek leave to have the hearing adjourned pending the fulfillment of meaningful consultation between the federal and provincial Crown and our clients."

On 9 September 2009 the Board issued a letter directing that the preliminary matter be brought by way of written motion. After providing a timetable, it indicated that:

The Board has considered whether this motion need be decided before the start of the hearing and has concluded that it does not. In particular, the Board is of the view that the prejudice that would accrue to parties who are prepared to proceed with the hearing outweighs the potential

negative consequences, if any, to Rath & Company and its clients, if the motion is successful. This is so, largely because the Board has decided to issue a decision on the motion prior to Keystone's panel 3 being called upon for cross-examination, which is the only Keystone panel that Rath & Company has indicated that it would have questions for. The Board notes that Rath & Company has requested to cross-examine other participants, but if these requests are granted, the cross-examination of those participants would all follow Keystone's presentation of its case and would be subsequent to Keystone's panel 3 being released.

The Board does not agree that its decision to decide the SFN and MFN motion after the commencement of the hearing demonstrates bias on its part. As the Board stated in its letter setting out the process for hearing the motion, when presented with an adjournment request less than 7 business days before the hearing, it sought to balance inconvenience that an adjournment would cause to parties ready to proceed to hearing against prejudice that might accrue to SFN and MFN if the hearing commenced as scheduled. The Board concluded that the hearing could commence but undertook to issue its ruling on the motion prior to the point that SFN and MFN indicated they would begin cross-examination of other parties. If, after hearing the motion, the Board granted the adjournment, it is difficult to see how SFN and MFN would be prejudiced by the evidence that had been heard to that point. There would have been no decision reached by the Board and the evidence to that point was not something that SFN and MFN indicated they were interested in. By the same token, if the motion were successful, the hearing could at that point be adjourned with no prejudice to SFN and MFN with respect to the matters of interest to them. Finally, given the complexity of the issues expected to be raised in the motion the Board determined that it would prefer to have the motion carried out in writing rather than orally at the beginning of the oral portion of the proceeding.

In these circumstances, the Board fails to see how a reasonable person might conclude that refusing to adjourn the hearing before its commencement would lead to the SFN and MFN being unable to obtain a fair hearing.

SFN and MFN Chiefs and Councils are Federal Boards

SFN and MFN

SFN and MFN submit that their Chiefs and Councils are "federal tribunals" within the meaning of section 2 and section 18.1 of the *Federal Court Act*. Unlike the NEB, the Chiefs and Councils are experts in matters pertaining to the determination of infringements of Aboriginal and Treaty

rights, therefore, the NEB should adjourn its process to allow the Federal Court Trial Division the ability to resolve the SFN and MFN's concerns.

Keystone

Keystone submits that there is no credible basis on which an argument may be made that the NEB must suspend its adjudication of the Proceeding until the Chiefs and Council of the Applicants have determined the potential impacts of the Project. The NEB is clearly acting within its express legislative mandate and any argument to the contrary is unfounded.

KSG

KSG submits that the Motion fails to explain why matters now before the National Energy Board cannot proceed concurrent with or in advance of the processes which the Chiefs and Councils are intending to pursue. Absent such information, even if the Chiefs and Councils ought to be considered as a federal board, the National Energy Board cannot extend comity to them and grant an adjournment.

Reply of SFN and MFN

SFN and MFN submit that the authority for the proposition that Chiefs and Councils are federal tribunals is set out in section 81.1 of the *Indian Act* and section 18.1 of the *Federal Court Act* and has over a hundred years of accepted practice, legal procedure and legal precedent. The Notice of Motion did not suggest the NEB is required to suspend its adjudication of the proceeding until the Chiefs and Council of the Applicants have determined the potential impacts of the project, but rather that this should be done out of respect for other practicing tribunals.

Views of the Board

The Board agrees with Keystone's submission that the authorities cited by Mr. Rath do not support the notion that Chiefs and Councils have overlapping jurisdiction with the NEB. The Board notes that SFN and MFN have had full opportunity to submit evidence in this proceeding, which could have included the opinions and views of their Chiefs and Councils. The Board is therefore not persuaded by Mr. Rath's argument that this assertion provides the basis for an adjournment.

The motion is dismissed.

Board Ruling on Requirements to File Contracts which were asked pursuant to National Energy Board Information Request No. 4 (IR No. 4)

The National Energy Board has reviewed the response to NEB IR No. 5 and believes that it still requires the contracts it asked for in NEB IR. No. 4 to fully assess the applied-for-project and assist the Board in the public interest determination it is required to make pursuant to section 52 of the National Energy Board Act (the Act).

The Board grants confidentiality protection to these contracts as detailed in the attached confidentiality Order.

The Board notes that contracts 1, 5, 7 and 11 which are the Base Keystone and Cushing proforma Transportation Service Agreements (TSAs) and Tariffs for Canadian transportation are available on the public domain, however, the Board requires that these contracts be filed publicly on the OH-1-2009 record.

The Board grants the Alberta Department of Energy (ADOE) request seeking access to the six proforma TSAs and Tariffs for U.S. transportation for the KXL, Base Keystone and Cushing segments. The ADOE must file assurances of non-disclosure and comply with the terms of the confidentiality Order.

The Board directs that the requested contracts identified in this letter and in the attached Order MO-13-2009, be filed no later than 1:00 pm, Tuesday 15 September 2009.

Appendix III

Certificate Conditions

General Conditions

1. Keystone shall comply with all of the conditions contained in this Certificate unless the Board otherwise directs.
2. Keystone shall cause the approved Project to be designed, located, constructed, installed, and operated in accordance with the specifications, standards and other information referred to in its application or as otherwise agreed to during questioning or in its related submissions.
3. Keystone shall implement or cause to be implemented all of the policies, practices, programs, mitigation measures, recommendations and procedures for the protection of the environment included in or referred to in its application or as otherwise agreed to during questioning in the OH-1-2009 proceeding or in its related submissions.

Prior to Construction Activities (including clearing or ground-breaking activities)

4. Environmental Tracking Commitments Table

Keystone shall maintain at its construction office(s):

- a) an updated Environmental Commitments Tracking Table listing all regulatory commitments, including but not be limited to all commitments resulting from:
 - i) the NEB application and subsequent filings;
 - ii) undertakings made during the OH-1-2009 proceedings; and
 - iii) conditions from permits, authorizations and approvals.

Keystone shall also file the updated Environmental Commitments Tracking Table, with the Board 15 days prior to construction.

- b) copies of any permits, approvals or authorizations for the applied-for facilities issued by federal, provincial or other permitting agencies, which include environmental conditions or site-specific mitigative or monitoring measures; and
- c) any subsequent variances to any permits, approvals or authorizations.

5. Horizontal Directional Drill

Keystone shall file with the Board either:

- a) upon successful completion of the Horizontal Directionally Drilled (HDD's) or HD bore watercourse crossing for the Red Deer, South Saskatchewan, and Frenchman Rivers and Piapot Creek, confirmation of their completion; or
- b) in the event of any changes to the proposed HDD/HD bore watercourse crossing method for the Red Deer, South Saskatchewan or Frenchman Rivers or Piapot Creek, at least 10 days prior to crossing,
 - i) notification in writing of such change to the proposed crossing method and the reason for that change;
 - ii) evidence of consultation with appropriate provincial and federal regulatory authorities that have an interest in the watercourse crossings and provide copies of all relevant correspondence from them; and
 - iii) file for approval, at least 10 days prior to implementing the revised watercourse crossing method, a description of amended reclamation and re-vegetation measures, and fish and fish habitat monitoring for the affected watercourse crossings.

6. Survey methodologies for rare and SARA listed Species

Keystone shall file with the Board for approval, at least 60 days prior to starting each pre-construction survey:

- a) a methodology for conducting the surveys for rare and SARA listed plants and rare ecological communities;
- b) a methodology for conducting the confirmatory surveys for faunal species of management concern (including Ord's kangaroo rat, swift fox, ferruginous hawk, burrowing owl, black tailed prairie dog, sharp tailed grouse, loggerhead shrike and SARA listed amphibians); and
- c) evidence of consultation on the above methodologies with appropriate provincial and federal regulatory authorities and provide copies of correspondence from these regulatory authorities regarding the methodology.

7. SARA listed Faunal Species

Keystone shall file with the Board for approval, at least 60 days prior to construction:

- a) the results of the confirmatory surveys for species of management concern, including Ord's kangaroo rat, swift fox, ferruginous hawk, burrowing owl, black

tailed prairie dog, sharp tailed grouse, loggerhead shrike and SARA listed amphibians;

- b) a detailed mitigation plan for each of the above species affected by construction and operation activities;
- c) evidence of consultation with appropriate provincial and federal regulatory authorities and copies of correspondence from these regulatory authorities regarding satisfaction with the proposed mitigation; and
- d) confirm that the EPP has been updated to include the mitigation measures.

Construction shall not commence until Keystone has received approval of its SARA survey results and mitigation plans from the Board.

8. SARA listed Plant Species

Keystone shall file with the Board for approval, at least 60 days prior to construction:

- a) the results of the surveys for rare and SARA listed plants and rare ecological communities;
- b) a detailed mitigation plan for each of these species affected by construction activity, including but not limited to:
 - i) measures to be implemented during construction;
 - ii) measures and a monitoring survey protocol for post-construction reclamation; and
 - iii) a survey methodology for determining the extent of non-avoidable impacts on rare and SARA listed plants and rare ecological communities.
- c) evidence of consultation with appropriate provincial and federal regulatory authorities and copies of correspondence from these regulatory authorities regarding satisfaction with the proposed mitigation plan; and
- d) confirmation that the EPP has been updated to include the relevant mitigation measures.

Construction shall not commence until Keystone has received approval of its SARA survey results and mitigation plans from the Board.

9. Protection of Rare and SARA listed Plants and Rare Ecological Communities

Keystone shall file with the Board for approval, at least 120 days prior to leave to open, a plan for the provision and implementation of offset measures for all non-avoidable impacts on rare and SARA listed plants and rare ecological communities. The plan shall include but not be

limited to, the results from surveys for determining the extent of non-avoidable impacts, and evidence of consultations with appropriate government agencies and relevant stakeholders.

10. Comprehensive Wetland Surveys

Keystone shall file with the Board for approval, at least 60 days prior to construction, a comprehensive wetland survey. The survey shall include:

- a) the methodology for conducting the survey;
- b) the results of the survey;
- c) the criteria, and the rationale for the criteria, for the crossing methods and mitigation measures to be employed;
- d) evidence demonstrating consultation with appropriate provincial and federal regulatory authorities; and
- e) confirmation that the EPP has been updated to include the mitigation measures.

11. Additional environmental surveys

Keystone shall file with the Board for approval, at least 60 days prior to construction, additional surveys and assessments committed to in its 28 August 2009 Supplemental evidence necessary to address facility location and route changes extending beyond the 1 km wide study corridor assessed for the ESA.

The surveys and assessments shall include:

- a) the methodology for conducting the surveys (for those methodologies not otherwise conditioned);
- b) the results of the surveys;
- c) mitigation measures;
- d) evidence of consultation with appropriate provincial and federal regulatory authorities; and
- e) confirmation that the EPP has been updated to include the mitigation measures.

12. Pre-construction Weed Surveys

Keystone shall file with the Board for approval, at least 60 days prior to construction:

- a) the results of the pre-construction weed surveys to identify the presence and density of weeds in areas that will be affected by the construction of the Keystone XL pipeline;

- b) the methodology for conducting the surveys;
- c) evidence demonstrating consultation with appropriate provincial and federal regulatory agencies regarding the methodology and results; and
- d) confirmation that the EPP has been updated to include the mitigation measures.

13. Environmental Protection Plan

Keystone shall file with the Board for approval

- a) at least 90 days prior to the commencement of construction, a draft Project-specific Environmental Protection Plan (EPP). The EPP shall be a comprehensive compilation of all environmental protection procedures, mitigation measures, and monitoring commitments, as set out in Keystone's application for the Project, subsequent filings or as otherwise agreed to during questioning in the OH-1-2009 proceeding or in its related submissions. The EPP shall also include measures arising from additional studies conducted in 2009 and 2010 with updated Environmental Alignment Sheets. The EPP, as appropriate, shall include but not be limited to:
 - i) seed mixes and criteria for their use in the reclamation of the project and confirmation that appropriate provincial and federal regulatory agencies have commented on the proposed seed mixes, and
 - ii) evidence that landowners have been consulted on seed mixes to be applied to their directly affected land;
 - iii) an updated Weed Management Plan, including evidence demonstrating consultation with appropriate provincial and federal regulatory agencies, and directly affected landowners in developing the plan.
 - iv) a Great Sand Hills Reclamation plan for pipeline construction, developed in consultation with appropriate provincial and federal regulatory agencies;
 - v) a Traffic Management Plan to minimize total activity including, where relevant, construction within 500 m buffer zone of Prairie dog colonies; and
 - vi) special trenchwater management procedures in areas where there is a likelihood of encountering shallow brine-impacted groundwater during dewatering for pipeline construction.
- b) at least 45 days prior to the commencement of construction, a final EPP for approval, which shall include but not be limited to, updated mitigations and any other updates resulting from survey results, and any changes resulting from consultation on the previous draft EPP. Keystone shall also provide evidence of consultations and describe how any outstanding concerns will be addressed.

Construction shall not commence until Keystone has received approval of its EPP.

14. Heritage Resources – clearances and mitigation

Keystone shall file with the Board, at least 30 days prior to commencement of construction:

- a) a copy of the letter of clearance received under the *Alberta Historical Resources Act*;
- b) all comments and recommendations received from the provincial authorities in Saskatchewan and Alberta regarding the Heritage Resources Impact Assessments; and
- c) for approval, the mitigation measures that Keystone proposes to address the comments and recommendations in b).

15. Greenhouse Gas Emissions

Keystone shall file with the Board, for approval, at least 60 days prior to construction, a quantitative assessment of greenhouse gas (GHG) emissions expected to directly result from the Keystone XL pipeline and its associated facilities, as applied for. The study shall cover both construction and operation of the pipeline and its associated facilities. In addition to the results of the assessment, the filing shall describe the calculation methodology used, identify assumptions and inputs, and describe what variables may affect the results. The filing should also describe mitigation measures to reduce emissions.

16. Aboriginal Consultation

Keystone shall continue to consult with Aboriginal groups who have expressed interest in the Project regarding the details of construction phase of the project as well as its plan for monitoring procedures for the protection of Aboriginal heritage and traditional resources.

Keystone shall file with the Board, at least 60 days prior to the commencement of construction, an update on its consultations with Aboriginal people, including:

- a) concerns raised by Aboriginal people;
- b) a summary indicating how Keystone will address any concerns raised during these consultations; and
- c) its plan describing monitoring procedures for the protection of Aboriginal heritage and traditional resources during construction.

During Construction Activities

17. Migratory Birds

In the event of construction or clearing activities within restricted activity periods for migratory birds, Keystone shall retain a qualified avian biologist to carry out a pre-construction survey to identify any migratory birds and active nests in areas immediately surrounding the site

(30 metres for migratory birds and 100 metres for raptors) and shall file with the Board at least 30 days prior to those construction or clearing activities:

- a) the results of the survey;
- b) mitigation, including monitoring, developed in consultation with Environment Canada and Canadian Wildlife Service, to protect any identified migratory birds or their nests; and
- c) mitigation, including monitoring, developed in consultation with Environment Canada and Canadian Wildlife Service to protect any identified *Species at Risk Act* birds or their nests; and
- d) evidence to confirm that the appropriate provincial and federal regulatory authorities have been consulted, on the proposed methodology for the survey, the results from the survey and the mitigation and monitoring to be used, and a description of any outstanding concerns they may have.

If no construction or clearing activities occur within restricted activity periods for birds, Keystone shall notify the Board of this within 15 days following the last restricted activity period to occur during construction.

18. Ongoing Landowner Consultations

For the duration of construction and for a period of at least five years following leave to open, Keystone shall maintain and upon request file with the Board a construction consultation and complaint monitoring report that provides a Landowner Consultation Tracking Table that will include, but not be limited to:

- a) a description of any landowner consultations undertaken including the method of consultation, dates, and a summary of any comments or concerns raised by landowners or potentially affected persons or groups;
- b) a summary of actions undertaken by Keystone to address each of the comments or concerns raised by potentially affected persons or groups; and
- c) a description of how Keystone intends to measure whether and to what extent it is achieving its stated objectives regarding consultation.

Post-Construction Activities

19. Post-Construction Environmental Monitoring

Keystone shall file with the Board, 6 months after the commencement of operation, and on or before the 31st January for each of the subsequent 5 years, a post-construction environmental monitoring report that:

- a) describes the methodology used for monitoring, the criteria established for evaluating success and the results found;
- b) assesses the effectiveness of the mitigation measures applied during construction against the criteria for success;
- c) identifies deviations from plans and alternate mitigation applied as approved by the Board;
- d) identifies locations on a map or diagram where corrective action was taken during construction and the current status of corrective actions; and
- e) provides proposed measures and the schedule Keystone shall implement to address any unresolved concerns.

Prior to Operation

20. Pipe Quality

Thirty days prior to requesting the leave to open provide a list of pipe that was received from the pipe supplier(s), identifying each manufacturer, identifying a traceable number with which each received pipe can be identified, an indication of whether the pipe was acceptable as received or not, and a list of all defects (as defined by CSA Z245.1), means of fixing defects, and source of defect (manufacturing, handling, installation).

Post-Construction and During Operations

21. Condition Compliance by a Company Officer

Within 30 days of the date that the approved Project is placed in service, Keystone shall file with the Board a confirmation, by an officer of the company, that the approved project was completed and constructed in compliance with all applicable conditions in this Certificate. If compliance with any of these conditions cannot be confirmed, the officer of the company shall file with the Board details as to why compliance cannot be confirmed. The filing required by this condition shall include a statement confirming that the signatory to the filing is an officer of the company.

22. Certificate Expiration

Unless the Board otherwise directs prior to 11 March 2011, this Certificate shall expire on 11 March 2011 unless construction in respect of the Project has commenced by that date.

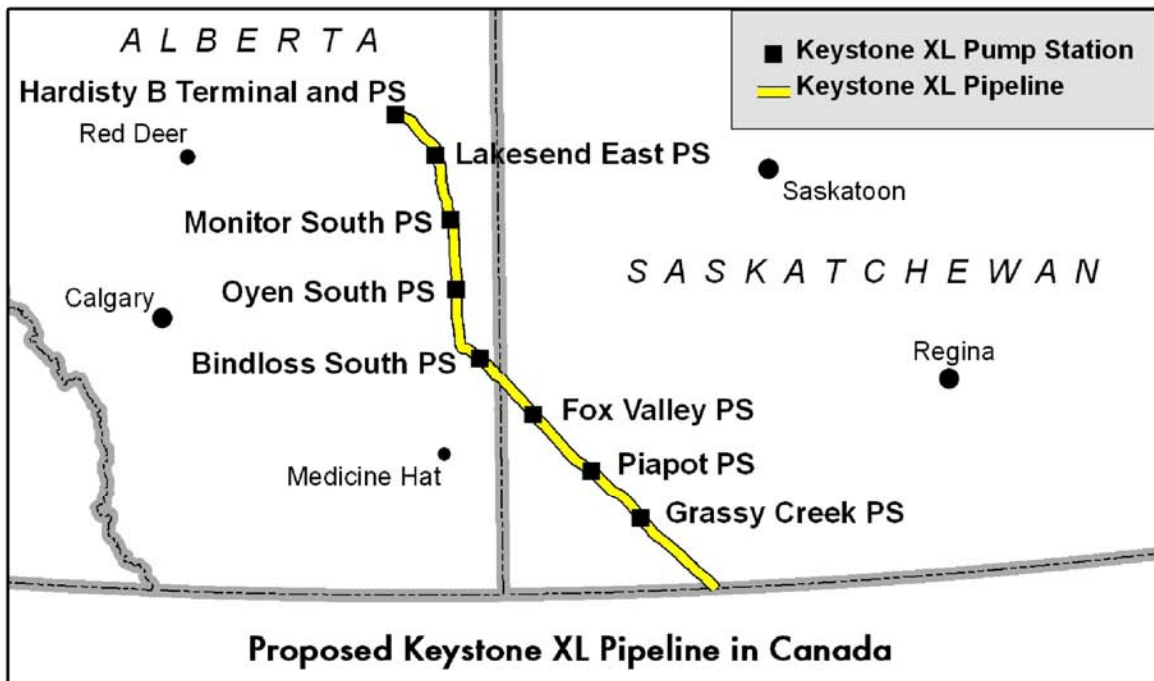
Appendix IV

Environmental Screening Report

ENVIRONMENTAL SCREENING REPORT Pursuant to the *Canadian Environmental Assessment Act* (CEA Act)

Keystone XL Pipeline Project

Applicant Name:	TransCanada Keystone Pipeline GP Ltd.		
Application Date:	27 February 2009	CEA Act Registration Date:	14 October 2008
National Energy Board (NEB or Board) File Number:	OF-Fac-Oil-T241-2009-01 01	CEA Registry Number:	08-01-43013
CEA Act Law List Trigger:	<i>National Energy Board Act, section 52</i>	CEA Act Determination Date:	4 March 2010



SCREENING SUMMARY

This report represents an Environmental Screening Report (ESR) for the Canadian portion of the TransCanada Keystone Pipeline GP Ltd.'s (Keystone) proposed Keystone XL Pipeline project (the Project). The Project would extend from Hardisty, Alberta (AB) to the international border between Canada and the U.S. near Monchy, Saskatchewan (SK). The Project would involve the construction and operation of approximately 529 km of new oil pipeline and related facilities, including new storage tank terminals at Hardisty, AB, a new initiating pump station and seven intermediate pump stations along the proposed pipeline in AB and SK. Approximately 69 km of new non-contiguous right-of-way (RoW) would be required.

The National Energy Board (Board or NEB) is the Federal Environment Assessment Coordinator for the applied-for Project. Transport Canada, Canada Transportation Agency and Agriculture and Agri-Food Canada have declared themselves as Responsible Authorities (RAs) and Environment Canada, Department of Fisheries and Oceans, Natural Resources Canada, Indian and Northern Affairs Canada and Health Canada declared themselves as Federal Authorities (FAs) in possession of specialist advice. Alberta Environment and Saskatchewan Environment also expressed an interest in monitoring and participating in the environmental assessment process.

The NEB has considered information provided by the Applicant, government departments, and the public during its review of the Project. The analysis in this ESR is based on the evidence placed on the record for the public hearing process held with respect to the Project, the full documentation of which can be found at the following internet hyperlink: <https://www.neb-one.gc.ca/11-eng/livelink.exe?func=11&objId=550305&objAction=browse&sort=-name>

This report has been prepared to meet the requirements of the *Canadian Environmental Assessment Act* (CEA Act). A draft ESR was made available to the public for comment, prior to the NEB determination. The final ESR includes comments received from RAs and FAs and Keystone.

As detailed in the ESR, a number of key environmental issues were identified including, *Species at Risk Act* listed species, rare plants and rare communities, fish and fish habitat, air quality, and wetlands. Pursuant to the CEA Act the Board has determined that, taking into account the implementation of Keystone's proposed mitigation measures, compliance with the Board's regulatory requirements and the recommended conditions attached to the Board's ESR, the Project is not likely to cause significant adverse environmental effects.

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LIST OF ABBREVIATIONS

AAFC	Agriculture and Agri-Food Canada
AB	Alberta
AENV	Alberta Environment
Board or NEB	National Energy Board
CEA Act	<i>Canadian Environmental Assessment Act</i>
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Department of Fisheries and Oceans
EA	Environmental Assessment
EC	Environment Canada
EPP	Environmental Protection Plan
ESA	Keystone's Environmental and Socio-Economic Assessment
ESR	Environmental Screening Report pursuant to the CEA Act
FAs	Federal Authorities as defined in subsection 2(1) of the CEA Act
FCN	Federal Coordination Notification
GSH	Great Sand Hills
HC	Health Canada
HDD	Horizontal Directional Drilling
HD bore	Horizontal Directional Bore
H ₂ S	Hydrogen Sulphide
Keystone	TransCanada Keystone Pipeline GP Ltd.
km	kilometre
LSA	Local Study Area
m	metre
m ³	cubic metre(s)
NEB Act	<i>National Energy Board Act</i>
NWPA	<i>Navigable Waters Protection Act</i>
PDA	Project Development Area

PFRA	Prairie Farm Rehabilitation Administration
RAs	Responsible Authorities as defined in subsection 2(1) of the CEA Act
RoW	Right of Way
RSA	Regional Study Area
SARA	<i>Species At Risk Act</i>
SCC	Sierra Club of Canada
SCADA	Supervisory Control and Data Acquisition
SE	Saskatchewan Environment
SK	Saskatchewan
TC	Transport Canada
VEC	Valued Ecosystem Component

1 INTRODUCTION

1.1 Project Overview

TransCanada Keystone Pipeline GP Ltd. (Keystone) has applied to the National Energy Board (NEB or Board) to construct and operate an approximately 529 kilometre (km) oil pipeline from a supply hub at Hardisty, Alberta (AB) to the Canada/U.S. border at Monchy, Saskatchewan (SK). This Keystone XL project (the Project) will also include a new initiating pump station at Hardisty, seven mainline pump stations, and a pipeline terminal at Hardisty, consisting of three operational storage tanks, each with a design capacity of 55,600 m³ (350,000 bbl) plus other related works and activities. Approximately 69 km of new pipeline right of way (RoW), not contiguous with or alongside existing RoW, would be required. The Project would have an initial capacity of approximately 111,300 m³/d (700,000 bbl/d) of commodity and is designed to be expandable to 143,100 m³/d (900,000 bbl/d).

Section 4.0 provides a more detailed description of the work associated with the Project.

1.2 Rationale for the Project

The purpose of the Project is to transport oil products from an oil supply hub at Hardisty, AB to markets in the Gulf Coast area of the United States. The Hardisty hub is supplied from the Western Canada Sedimentary Basin, which is forecast to grow by at least 247,000m³/d (1.6 million bbl/d) from 2007 to 2017. In support of the Project, Keystone has secured long-term transportation contracts totaling 60,400m³(380,000bbl/d) with an average duration of 17 years.

1.3 Baseline Information and Sources

The analysis for this Environmental Screening Report (ESR) is based on information from the following sources:

- Keystone's Project application;
- Keystone's Environmental and Socio-Economic Assessment (ESA);
- Supplementary filings to the Project application;
- Responses to information requests from the NEB and other parties;
- Written evidence from the public and interested parties including letters of comment;
- Evidence submitted at the oral public hearing; and
- Comments received from government agencies and Keystone on the draft ESR.

Filed information pertaining to the Project application can be found within "regulatory Documents" on the NEB's website (www.neb-one.gc.ca) at <https://www.neb-one.gc.ca/ll-eng/livelink.exe?func=ll&objId=550305&objAction=browse&sort=-name>. For more details on how to obtain documents, please contact the Secretary of the NEB at the address specified in section 10 of the Report.

2 ENVIRONMENTAL ASSESSMENT (EA) PROCESS

The application for the Project was filed pursuant to section 52 of the *National Energy Board Act* (NEB Act), which is included in the *Canadian Environmental Assessment (CEA) Act Law List Regulations* thereby requiring an EA under the CEA Act. Since the Project would not require more than 75 km of new RoW, as defined in the *CEA Act Comprehensive Study List Regulations*, the project is subject to a screening level of EA under the CEA Act.

2.1 Government Participation in the Pre-Application EA Coordination Process

Prior to Keystone's 27 February 2009 Application to the NEB, on 18 July 2008 Keystone filed a Project Description to initiate federal coordination for the EA for the Project. As the Federal Environmental Assessment Coordinator and pursuant to the CEA Act *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements* (Federal Coordination Regulations), on 31 July 2008 the NEB sent a federal coordination notification letter (FCN letter) to federal departments with a potential interest in the Project and its EA. The Table below identifies the government agencies that were notified and their roles with respect to the EA for the Project. Refer to Section 6.0 for a summary of public and government comments.

Table 1: Role of Federal Government Agencies in the CEA Act Process

Responsible Authorities (RAs)	CEA Act Trigger
NEB	NEB Act section 52
Agriculture and Agri-Food Canada (AAFC)	Any pipeline crossings of AAFC lands for which Keystone requires AAFC licences.
Transport Canada (TC)	<i>Navigable Waters Protection Act (NWPA)</i> and section 108(4) of the NEB Act, any watercourse crossings (pipeline crossings and bridges) of navigable waterways. These include Red Deer River, South Saskatchewan River and Frenchman River crossings.
Canadian Transportation Agency (CTA)	Section 101(3) of the <i>Canada Transportation Act</i> , any pipeline crossings of federally regulated railway lines.
Federal Authorities (FA) with specialist advice <ul style="list-style-type: none"> ▪ Fisheries and Oceans Canada (DFO) ▪ Environment Canada (EC) ▪ Health Canada (HC) ▪ Natural Resources Canada (NRcan) ▪ Indian and Northern Affairs Canada (INAC) 	

The FCN letter was also sent to provincial agencies in AB and SK. Alberta Environment (AENV) and Saskatchewan Environment (SE) expressed an interest in monitoring and participating in the EA although Provincial EA legislation was not triggered.

As part of pre-application federal coordination, the NEB in consultation with RAs and FAs prepared a draft scope of the EA for the Project, a notice of which was posted on the CEA Registry on 22 December 2008.

2.2 Opportunities for Public Input into the EA

On 12 May 2009, the NEB released Hearing Order OH-1-2009, describing the process of the oral public hearing for the Project. The NEB process allowed for a number of opportunities for the public (including government agencies and Aboriginal groups) to participate and provide input into the EA by providing comments on the scope of EA and list of issues, and by either filing a letter of comment, presenting an oral statement at the hearing or by participating as an intervenor. The Government Participant option was provided to government authorities with EA responsibilities to allow them to participate without becoming intervenors.

As described in Hearing Order OH-1-2009, the NEB held a public hearing process to consider the Application for the Project, with the oral portion of the hearing being held in Calgary from 15 September to 2 October 2009.

In addition, the draft Scope of the EA was attached to the Hearing Order inviting comments from the public including Aboriginal groups and government agencies on the scope of the EA for the Project. The parties were provided with an opportunity to suggest amendments or additions to the scope by filing their suggestion with the Board by 9 June 2009.

On 1 December 2009, the NEB sent a letter to interested parties inviting comments on the draft ESR. Further, a notice for public comment on the draft ESR was posted on the CEA Registry. Appendix 2 provides a summary of the key comments, some of which resulted in wording changes to the ESR. Explanations have been included for those comments that did not result in changes to the ESR.

3 SCOPE OF THE EA

The Scope of the EA (Scope) is composed of three parts:

1. Scope of the Project;
2. Factors to be Considered; and
3. Scope of the Factors to be Considered.

The Scope, as determined by the RAs, in consultation with the FAs and the public, in accordance with the CEA Act and the Federal Coordination Regulations, is included in Appendix 1 of this ESR and provides further information on these three parts.

4 DESCRIPTION OF THE PROJECT

Table 2: Details of the Project

Physical Work and/or Activity
<i>Construction Phase: timeframe: Proposed start in 2010 and completed by third quarter of 2012</i>
<ul style="list-style-type: none">▪ Construction of approximately 529 km (269 km in AB and about 260km in SK) of new 914 mm diameter (NPS 36) pipeline, of which 460 km is contiguous with existing pipeline RoW and about 69 km is non-contiguous▪ Construction RoW would be approximately 32 m wide and consist of about 13m to 20m permanent RoW, with about 12 m to 19 m of temporary workspace

Physical Work and/or Activity
<ul style="list-style-type: none"> Construction of the Hardisty B terminal consisting of three operational storage tank terminals with external floating roofs at the existing Hardisty tank terminal, each with a design capacity of about 55,600m³, along with ancillary facilities such as an initiating pump station, metering, control systems and pipeline interconnections Construction of seven mainline pump stations; four in AB namely, Lakesend, Monitor, Oyen South and Bindloss and three in SK namely Fox Valley, Piapot and Grassy Creek 32 mainline valve sites, launchers and receivers for maintenance and in-line inspections, cathodic protection for the pipeline and valves The Project would also include site preparation (clearing, stripping, stockpiling, grading and trenching), hydrostatic testing, and final reclamation Only one pump station (Fox Valley pump station) would require new access road (approximately 400 m). New access roads would not be required for remaining pump stations as they are located next to existing access roads The Red Deer River and South Saskatchewan River would be crossed using Horizontal Directionally Drilled (HDD) methods. The Frenchman river and Piapot creek would be crossed using a trenchless, low pressure horizontally drilled (HD) bore. All remaining watercourses would be crossed using an isolated method approach outside the restricted activity period or using an open-cut method when the watercourses would be dry or frozen New power lines and interconnects to supply power to pump stations and valve sites would be constructed, owned and operated by independent local power providers and would be subject to a separate regulatory process
<i>Operation Phase – Timeframe: 40+ years</i>
<ul style="list-style-type: none"> Computer based supervisory control and data acquisition (SCADA) system would be used to monitor and control pipeline operations from the company's existing Operations Control Centre in Calgary Regular aerial patrols, internal inspections and cathodic protection monitoring, pipeline markers at roads and pipeline watercourse crossings Operational maintenance and equipment/vehicle operation Maintenance of access roads Vegetation control for non-native and noxious plant species Periodic monitoring and follow-up for reclamation at wetlands, watercourses and native range Pipeline integrity maintenance, monitoring and emergency response for oil leaks and ruptures The project would follow the company's existing integrated public awareness program
<i>Abandonment Phase – Timeframe: 40+ years</i>
<ul style="list-style-type: none"> At the end of service life of the Project, an application pursuant to paragraph 74(1)(d) of the NEB Act would be required for its abandonment, at which time the environmental effects of the proposed abandonment activities would be assessed by the NEB under both the NEB Act and the CEA Act

5 DESCRIPTION OF THE ENVIRONMENT

Keystone used the following spatial boundaries to determine and assess the study area:

- The Project development area (PDA) encompasses the standard 32-m construction RoW and footprints associated with constructing the pipeline, access roads and associated facilities (e.g. pump stations);
- The local assessment area (LAA) includes the area over which the environmental or socio-economic effects of the Project could be measurable. For several of the disciplines, the LAA includes the project footprint and a 500-m buffer on either side of the RoW. For some components, the PDA coincided with the LAA; and

- The regional assessment area (RAA) is defined as the area including and extending beyond the LAA and varying with each discipline.

The following environmental elements have been described in detail in the ESA for the proposed Keystone Project.

Physical environment

- The Project traverses an area of southeastern AB and southwestern SK characterized by gently rolling plains.
- The route passes through the Aspen Parkland region, the Moist Mixed Grassland ecoregion and the Mixed Grassland ecoregion.
- The Project intersects the Great Sand Hills (GSH) area, a rare ecosystem. However, it is more than 15 km away from the GSH Reserve core area protected under the Provincial Lands Act of Saskatchewan.

Land Use and Socio-Economic Environment

- The primary land use traversed by the Project is agricultural and includes cropland, reseeded pasture and rangeland. The most agriculturally productive areas traversed by the Project are Aspen Parkland and Moist Mixed Grassland ecoregions. Other land uses include oil and gas resources and recreational activities.
- The Project route commences at Hardisty, a major hub for oil movement and export from AB.
- There are Crown lands to be disturbed for new construction in both AB and SK. In AB, 42 percent of all land traversed by the pipeline is provincial Crown land, with 36 percent designated Special Areas. In SK, 25 percent of all land traversed by the pipeline is provincial Crown land. The Project will traverse three community pastures administered by the federal Prairie Farm Rehabilitation Administration (PFRA), a branch of Agriculture and Agri-Foods Canada. Two of the PFRA community pastures Val Marie and Masfield occur along the south portion of the route in the swift Current Land Management District. The third community pasture, Big Stick, is located in the Maple Creek Land Management District in the central portion of the route through SK.
- The Red Deer, South Saskatchewan and Frenchman rivers have been determined as navigable by TC's Navigable Waters Protection Program.
- The Project is routed through rural areas of AB and SK with low population densities, which have experienced conventional oil and gas extraction activities in the past.
- The labour force in all areas is almost fully employed.

Soils

- The landscape is dominated by glacial surficial deposits, with bedrock exposures confined to the major river valleys.
- A precipitation gradient is observed from north to the south along the Project and is evident from the topsoil colour in the soil zones.
- Major soil forming processes experienced along the project route include salinisation and subsequent solodisation (solonchic soils) and wind erosion (regosolic soils on coarse textured areas).

Vegetation

- The selected route would cross ten environmentally significant areas within the LAA, four of which are identified as having national value, and six as having provincial value.
- Native vegetation increases along the pipeline route from Hardisty, AB to Monchy, SK.
- Remnant areas of Aspen Parkland are present between Hardisty and Gooseberry Lake; AB; native grasslands of the Moist Mixed Grassland ecoregion are dominated by plains rough fescue and Kooker's oatgrass; and native vegetation in the Mixed Grassland ecoregion is characterized by short and mid-height grasses.
- Rare plants and rare ecological communities were identified along the Project route in AB and SK. The project traverses through areas with known occurrences of plant species listed under Schedule I of the *Species at Risk Act* (SARA) (Slender mouse-ear cress - Schedule I threatened and Tiny Cryptanthus – Schedule I endangered species).
- A number of provincially listed species also have the potential to occur on the proposed route.

Wildlife and Wildlife habitat

- The Project area provides habitat for many species of migratory and non-migratory birds and traverses through important bird areas at Gooseberry Lake, AB and Bigstick Lake Plain, SK.
- In SK, the Project traverses *Wildlife Habitat Protection Act* lands, which are provincially registered wildlife reservations.
- Two amphibian species listed on Schedule I of SARA (the Great Plains Toad and Northern Leopard Frog) were identified in wetlands along the project route in both AB and SK.
- Three Schedule I SARA bird species (Sprague's Pitpit, Loggerhead Shrike and Long-billed Curlew), two burrowing owl nest sites listed as "endangered" on Schedule I of SARA and ten Ferruginous Hawks listed as "Special concern" were observed in the wildlife LAA along the Project route in AB and SK.
- Two mammalian SARA-listed species (Ord's Kangaroo Rat and Black-tailed Prairie Dog) were observed only in SK.
- There are several wetlands, sloughs and lakes along the Project route.

Atmospheric Environment

- A number of other existing storage tanks and related facilities are located at Hardisty tank terminal and affect the ambient air quality.

Acoustic Environment

- Noise levels in and around the Hardisty terminal are typical of an industrial facility. Ambient noise levels along the rest of the proposed RoW are generally quiet reflecting the more rural setting but subject to diurnal fluctuations and local noise sources such as vehicular traffic.

Wetlands

- There are small ephemeral, semi-permanent and permanent wetlands present along the proposed route. The total length of wetlands along the project route including both contiguous and non-contiguous pipeline RoW is 16.15 km in AB and 25.21 km in SK. Keystone will be conducting additional wetland surveys to refine the distribution of wetlands in the Project footprint.

Fish and Fish habitat

- The Project would cross 16 watercourses (10 in SK and 6 in AB), 13 of which are fish bearing.
- No fish species listed under Schedule I SARA were found within the Project area; however Lake Sturgeon are known to be present in the South Saskatchewan River and are considered as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and consultations are underway to list this species under SARA.

Hydrogeology

- The RoW crosses areas where shallow surficial aquifers with high groundwater yields exists in AB and SK and can be susceptible to surface contamination.
- A portion of the RoW east of Hardisty, AB is located between Alkali Lake and Shorncliffe Lake where salt affected groundwater has been observed.

Heritage and Paleontological Resources

- The Project's SK segment would cross the southern edges of the Great Sand Hills, an area recognized as having a high concentration of heritage resources.
- There are 125 previously recorded heritage resources near the proposed route in AB and 133 previously recorded heritage resources near the proposed route in SK. An additional 30 sites were located in SK and 19 sites in AB in the course of field surveys for the Project.

Aboriginal People and Traditional Land and Resource Use

- The route traverses lands covered by Treaty No. 4, Treaty No. 6, and Treaty No. 7, as well as traditional territories claimed by Cree, Blackfoot, Dakota, Saulteaux, and Métis communities.
- The Neekaneet and Red Pheasant First Nations stated that they continue to pursue traditional land uses in proximity to the route, including gathering of plants for traditional and medicinal use and hunting. The Sweetgrass and Moosomin First Nations also indicated that they continue to pursue traditional land use practices that would be affected by the Project.

6 COMMENTS FROM THE PUBLIC

6.1 CEAA-Related Project Issues Raised in Comments Received by the NEB

Several project-related issues were raised by the public to the Board. To view the submitted documents, please refer to the NEB website (www.neb-one.gc.ca) at <https://www.neb-one.gc.ca/ll-eng/livelink.exe?func=ll&objId=550305&objAction=browse&sort=-name&redirect=3>, and either select on the appropriate folder / subfolder or enter the Exhibit Number from the table below in the Search box.

Evidence was received from the Alberta Federation of Labour (AFL) and the Communications, Energy and Paperworkers Union of Canada (CEP) with respect to exporting of non-processed resources and loss of potential to create jobs. The submissions from AFL are outside the Scope of the EA for this Project and are addressed in the Board's Reasons for Decision (RFD).

The Sierra Club Canada (SCC) also raised EA policy and process related questions which, being broader in implication, are more appropriately addressed in the RFD than in this project-specific ESR.

Table 3: Submissions to the NEB

Name, date of submission and Exhibit Number	Comments
SE, 27 July 2009, E-6-1	<ul style="list-style-type: none">▪ Wildlife and wildlife habitat▪ Criteria for valve locations▪ Weed management Plan▪ Reclamation and stabilization of native vegetation▪ Surface water/ground water use or diversion▪ Watercourse crossings▪ Hydrostatic testing▪ Heritage resources
AAFC, 30 July 2009, D-1-4	<ul style="list-style-type: none">▪ Species at Risk▪ Reclamation▪ Seed mixes
TC, 9 June 2009, D-4-2	<ul style="list-style-type: none">▪ Watercourse crossings▪ Aboriginal concerns
EC, 29 July 2009, E-5-1	<ul style="list-style-type: none">▪ Migratory Birds▪ Species at Risk▪ Wetlands▪ Valve Placement▪ Wildlife and wildlife habitat▪ Reclamation
DFO, 29 June 2009, D-2-2	<ul style="list-style-type: none">▪ Watercourse crossings▪ Fish and fish habitat▪ Hydrostatic testing▪ Reclamation

Name, date of submission and Exhibit Number	Comments
Dale and Shirley McInnes, June 2009, C- 22	<ul style="list-style-type: none"> ▪ Negative impacts due to location of Grassy Creek pump station ▪ Noise concerns ▪ Light and visual impacts ▪ Odours ▪ Safety
Creston Anderson, June 2009, C-21	<ul style="list-style-type: none"> ▪ Noise concerns due to location of Grassy Creek pump station
June 2009: Craig Wilkins, C-26; Mary Swenson, C-25; Daryl Swenson, C-26; Dennis Swenson, C-24; Staples Farms Ltd., C-14	<ul style="list-style-type: none"> ▪ Noise concerns due to location of Bindloss pump station

Following the release of the draft ESR, a number of comments were received from EC and TC. Keystone also provided comments, including responses to a number of the comments made by these government agencies. To view the submitted documents, please refer to the NEB website (www.neb-one.gc.ca) at <https://www.neb-one.gc.ca/ll-eng/livelink.exe?func=ll&objId=550305&objAction=browse&sort=-name&redirect=3>, and select on the folder 'Environmental Screening'. Appendix 2 provides a summary.

6.2 Project-Related Issues Raised through Consultation Conducted by the Applicant

Keystone initiated its consultation program in March 2008 at the outset of the Project planning process. The program involved a variety of activities including direct contact with landowners, meetings with interest groups and government officials, public notices, open houses and the establishment of Project toll-free telephone lines, a Project e-mail address and Project website.

Keystone reported that concerns raised by the public included routing and pump station locations, integrity/safety/leaks, exporting of resources, traffic and increased road use, depth of cover for agricultural/ranch lands and road crossings, environmental impacts in Great Sand Hills Planning District, reclamation procedures, watercourse crossings, use of local infrastructure, emergency response procedures, land acquisition, impacts to agricultural lands and usage, and local socio-economic benefits.

In the Application, Keystone submitted that all issues raised by stakeholders had been resolved or were expected to be resolved to the satisfaction of the affected stakeholders. Where issues have not been resolved with landowners, Keystone committed to on-going consultation. Keystone also committed to ongoing consultation with all potentially impacted parties and noted that its consultation would be guided by TransCanada's consultation practices and Aboriginal Relations Policy.

The Board has given due consideration to all comments raised throughout this proceeding. The comments that relate to the Board's *CEA Act* mandate have been considered in the preparation of this ESR. A thorough consideration and discussion of all consultation matters, including the appropriateness of consultation design, implementation and outcomes, and requirements for ongoing and future consultations, will be included in the Board's RFD.

6.3 Comments received from Aboriginal Groups

Six Aboriginal communities and one Aboriginal organization participated in the OH-1-2009 proceeding. Alexander, Moosomin, Nekaneet, Red Pheasant, and Sweetgrass First Nations participated as intervenors, while letters of comment were filed by the Blood Tribe and the Federation of Saskatchewan Indian Nations (FSIN). The issues that these parties raised included: company consultation, Crown consultation, potential impacts on traditional and treaty lands and community uses of those lands, the adequacy of the traditional knowledge study, and potential employment opportunities and economic benefits.

Most of these issues are process related, and are discussed in the RFD for the OH-1-2009 proceeding. The issue of potential impacts on traditional and treaty lands and community uses of those lands is considered within this ESR. Keystone stated in its application that it would continue to follow its Aboriginal engagement process throughout the construction phase in the event of Project approval. It explained that this process includes discussions with Aboriginal communities to identify suitable mitigation of any Project-related impacts to current traditional land use and heritage and cultural resources. In the operations phase, Keystone plans to implement TCPL's Integrated Public Awareness program as a means to carry out on going Aboriginal consultation for the Project.

Since Aboriginal consultation is an ongoing process for any project, a condition directing Keystone to continue its consultations and to file a report on the results of those consultations before the start of construction would be recommended for inclusion in any approval (Condition L). This would ensure the effectiveness and adequacy of Aboriginal consultation for the Project. Keystone has acknowledged TC's comment that any site-specific mitigation for the prevention or minimization of Project-related impacts on current traditional land use should be included in the EPP. The Board would expect such information to be included in the EPP accordingly as part of Condition K.

7 METHODOLOGY OF THE NEB'S ENVIRONMENTAL ASSESSMENT

In assessing the environmental effects of the Project, the NEB used an issue-based approach. In its analysis within Section 8.2, the NEB identified interactions expected to occur between the proposed project activities and the surrounding environmental elements. Also included were the consideration of potential accidents and malfunctions that may occur due to the Project and any change to the Project that may be caused by the environment. If there were no expected element/Project interactions then no further examination was deemed necessary. Similarly, no further examination was deemed necessary for interactions that would result in positive or neutral potential effects. In circumstances where the potential effect was unknown, it was categorized as a potential adverse environmental effect.

Section 8.3 provides a brief overview of the Board's consideration of Keystone's standard design and practices to be relied on to mitigate the majority of potential adverse environmental effects.

Section 8.4 provides a more detailed analysis of potential adverse environmental effects, selected based on, public concern, the use of non-standard design or mitigation, or the relative importance of the elements in question in the context of this application. The analysis specifies those

mitigation measures, the ratings for criteria used in evaluating significance (as defined in Table 4 below), any monitoring and/or follow-up programs, and the views of the NEB along with any issue-specific recommendations are also provided.

Section 8.5 addresses cumulative effects, Section 8.6 addresses follow-up programs and Section 8.7 lists recommendations for any subsequent regulatory approval of the Project.

Table 4: Evaluation of Significance Criteria

Criteria	Rating	Definition
All criteria	Uncertain	When no other criteria rating descriptor is applicable due to either lack of information or inability to predict
Frequency (how often would the event that caused the effect occur)	Accidental	A rare and unplanned occurrence over assessment period
	Single	One time event within any phase of the project lifecycle
	Multiple/Frequent	Multiple occurrences during any phase of the project lifecycle
	Continuous	Continuous through any phase of the project lifecycle
Duration (duration of the effect)	Short-term	Adverse environmental effect duration is in the order of months and/or limited to the proposed construction
	Medium-term	Adverse environmental effect duration is in the order of a few years
	Long-term	Adverse environmental effect would remain evident throughout the planned operation of the pipeline or beyond the lifecycle of the Project
Reversibility	Reversible	Adverse environmental effect expected to return to baseline conditions within the life of the project
	Possible	Adverse environmental effect may or may not return to baseline conditions within the life of the project
	Irreversible	Adverse environmental effect would be permanent, or reversible only beyond the lifecycle of the project
Geographic Extent	Project Development Area (PDA)	Effect would be limited to construction RoW and footprints associated with constructing the pipeline, access roads and associated facilities such as pump stations
	Local Assessment Area (LAA)	Effect would generally be limited to 500 m buffer on either side of the RoW or falls within an element specific standard (e.g.1500 m for noise as per Alberta Energy Resources Conservation Board's (ERCB) Directive 38
	Regional Assessment Area (RAA)	The area including and extending beyond the study area. The boundary varies with each discipline and can include natural sub regions, the home ranges of wildlife species, an airshed
Magnitude	Low	<ul style="list-style-type: none"> Effect is negligible, if any Effect anticipated to be restricted to a few individuals/species or only slightly affect the resource or parties involved Proposed project is consistent with, and effect is confined to land use zoning Effect would impact quality of life for some, but individuals commonly adapt or become habituated, and the effect is widely accepted by society
	Moderate	<ul style="list-style-type: none"> Effect would impact many individuals/species or noticeably affect the resource or parties involved Effect is detectable but below environmental, regulatory and/or

Criteria	Rating	Definition
		social standards or tolerance <ul style="list-style-type: none"> Proposed project is consistent with land use zoning and effect would encroach on neighboring land use sensitivities Effect would impact quality of life but the effect is normally accepted by society
	High	<ul style="list-style-type: none"> Effect would affect numerous individuals or affect the resource or parties involved in a substantial manner Effect is beyond environmental, regulatory and/or social standards or tolerance Proposed Project is not inconsistent with land use zoning or inconsistent with other land uses and sensitivities Effect would impact quality of life, result in lasting stress and is generally not accepted by society except under extenuating circumstance
Evaluation of Significance	Likely to be significant	Effects that are of high magnitude, or of continuous, irreversible, long term duration and regional in extent
	Not likely to be significant	Any adverse effect that does not meet the above criteria for “Likely to be Significant”

8 ENVIRONMENTAL EFFECTS ANALYSIS

8.1 Routing of the Pipeline

Keystone developed Project-specific routing and criteria for evaluation of a number of alternative routes for the Project. Each of these routing alternatives was evaluated by Keystone’s interdisciplinary team comprising of engineering, construction, environmental and land specialists. For the AB segment (from Hardisty to McNeill), Keystone evaluated three potential alternative corridors based on length, constructability, minimizing non-contiguous length, minimizing watercourses and wetland crossings, and avoiding known environmentally sensitive land use features. In SK, Keystone selected the corridor based on the existing linear infrastructure.

Alternative route options for the crossing of the South Saskatchewan River were also considered because of environmental and constructability constraints in the vicinity of the river. An alternative route to paralleling the existing Keystone pipeline was selected because this route is shorter and therefore creates a smaller project footprint, and to avoid known SARA-listed plant sites.

Keystone’s criteria for the selection of pump station sites included access from all-weather roads; proximity to existing power infrastructure; avoidance of permanent wetlands, native range and sites with documented occurrences of provincially or federally listed wildlife and plant species; constructability; and, public and stakeholder input.

Subsequent to its Application, in the summer of 2009, Keystone proposed some route modifications which resulted in the total of new non-contiguous RoW increasing to 69 kms. Additionally, Keystone relocated the Lakesend and Piapot pump stations to avoid a wetland and archaeological sites that were identified during surveys.

8.2 Project - Environment Interactions

Bio-Physical	Environmental Element	Description of Interaction (How, When, Where), or why no interaction is expected	Potential Adverse Environmental Effect	Standard Mitigation to be Implemented (See section 8.3) and/or reference for Further Detailed Assessment
	Physical Environment – unique landforms	<ul style="list-style-type: none"> The Project traverses the GSH area and would entail construction equipment, clearing, stripping, grading, excavation and backfilling through the GSH area, including under non-frozen conditions 	<ul style="list-style-type: none"> Erosion of sandy soils and reduced biodiversity in the GSH area 	Y (Refer section 8.4.7 for details)
	Soil and Soil Productivity	<ul style="list-style-type: none"> Use of construction equipment and vehicles in clearing, stripping, grading, excavation and backfilling, at pump station sites and along the entire RoW 	<ul style="list-style-type: none"> Topsoil loss, compaction or mixing during handling Topsoil loss from surface water erosion or wind erosion Topsoil loss through trench instability Mobilization of existing soil contamination 	Y Y Y Y
	Vegetation and rare plants	<ul style="list-style-type: none"> Clearing, stripping, construction and operation activities along the RoW Non-native or invasive weed introduction and spreading from contaminated equipment, seed mixes or mulches, or by invasion from nearby areas Long term operational control and management of vegetation on the RoW 	<ul style="list-style-type: none"> Disturbance of grasses and forbs Fragmentation of native prairie Loss or alteration of native vegetation, rare ecological communities and rare plants Alteration of wildlife habitat Infestations of non-native or weed species outcompeting desired vegetation 	Y (Refer section 8.4.2 for details) Y
	Water Quality and Quantity	<ul style="list-style-type: none"> RoW clearing, stripping, grading, excavation and backfilling activities may disrupt surface and groundwater flows and quality Failure of watercourse isolation measures during excavation of a watercourse Failure of HDD or HD bore Failure of a temporary crossing over a watercourse 	<ul style="list-style-type: none"> Long term interference in natural succession due to operational vegetation control Alteration of surficial natural drainage patterns Disruption of subsurface hydrologic flow and reduction of ground water quality and quantity Disruption to waterwell flows Introduction of sediments to surface water Introduction of contaminants, including any other deleterious substances 	Y (Refer section 8.4.2 for details) Y Y Y Y Y

	Environmental Element	Description of Interaction (How, When, Where), or why no interaction is expected	Potential Adverse Environmental Effect	Standard Mitigation to be Implemented (See section 8.3) and/or reference for Further Detailed Assessment
		<ul style="list-style-type: none"> Use of large volumes of water for hydrostatic testing of pipelines Excavation of trench through salt-affected area 	<ul style="list-style-type: none"> Sediment entering watercourse and erosion of disturbed areas adjacent to water bodies Deterioration of aquatic ecological integrity (fish bearing and no-fish bearing) and loss of fish habitat (See next element) Decreased surface water quality, soil quality, alteration or loss of vegetation 	<p>Y</p> <p>Y</p> <p>N (Refer section 8.4.4 for details)</p>
	Fish and Fish habitat	<ul style="list-style-type: none"> Clearing, grading, excavation, and backfilling at watercourse crossings along the RoW Excavations of smaller watercourses would occur outside restricted activity periods Failure of a temporary crossing over a watercourse Failure of HDD or HD bore Use of large volumes of water for hydrostatic testing of pipelines 	<ul style="list-style-type: none"> Fish mortality (direct or indirect) and the alteration, disruption or destruction of fish habitat Harmful alteration, disruption or destruction of fish habitat from the pipeline installation and access 	<p>Y (Refer section 8.4.3 for details)</p> <p>N (Refer section 8.4.3 for details)</p>
	Wetlands	<ul style="list-style-type: none"> Clearing, grading, excavation, and backfilling within proximity of wetlands 	<ul style="list-style-type: none"> Loss of wetland function, terrestrial and aquatic habitat in wetlands Disturbance to surface water and subsurface hydrologic flow 	<p>N (Refer section 8.4.5 for details)</p>
	Wildlife and Wildlife Habitat	<ul style="list-style-type: none"> Removal of shrubs and trees during clearing of RoW and temporary workspace Excavation of trench Increased noise levels, from construction along RoW and from pump station operations Worker interaction with wildlife Waste generated by construction activity Long term operational control and management of vegetation on the RoW 	<ul style="list-style-type: none"> Disturbance of wildlife habitat Disturbance to nesting birds Sensory disturbance to wildlife Displacement of wildlife Wildlife conflicts and mortality Habituation of wildlife to construction waste Increased and long term vegetation management on the RoW 	<p>Y (Refer section 8.4.1 for details)</p>

	Environmental Element	Description of Interaction (How, When, Where), or why no interaction is expected	Potential Adverse Environmental Effect	Standard Mitigation to be Implemented (See section 8.3) and/or reference for Further Detailed Assessment	
				Y	
	SARA listed species (faunal)	<ul style="list-style-type: none"> Project RoW traverses through potential habitat of listed amphibian, bird and mammal species Construction activities associated with clearing, grading, excavation, installation and backfilling 	<ul style="list-style-type: none"> Loss or reduced habitat, mortality, stress, reduced reproductive success with concomitant population declines 	Y	
			<ul style="list-style-type: none"> Disturbance to SARA listed amphibian species and habitat 	N	(Refer section 8.4.1 for details)
			<ul style="list-style-type: none"> Disturbance to SARA listed birds 	Y	
			<ul style="list-style-type: none"> Disturbance to SARA listed mammals 	U	(Refer section 8.4.1 for details)
	Air Quality	<ul style="list-style-type: none"> Air emissions from vehicles and equipment operation during construction Dust raised by vehicles and equipment on gravel roads and the RoW Operations related emissions (including hydrogen sulphide (H₂S), benzene and mercaptans) from evaporation of volatile components of oil products stored in the tanks at Hardisty 	<ul style="list-style-type: none"> Minor reductions in local air quality 	Y	(Refer to section 8.4.6 for details)
			<ul style="list-style-type: none"> Temporary reductions in local visibility from dust 		
			<ul style="list-style-type: none"> Air emissions at Hardisty could potentially cause nuisance odours and human health effects on adjacent residents 		
Socio-Economic	Human Occupancy/ Resource Use	<ul style="list-style-type: none"> Clearing and construction activities on the RoW Loss of agricultural lands to accommodate the construction and operation of above ground facilities 	<ul style="list-style-type: none"> Disturbance to agricultural operations 	Y	
	Heritage Resources	<ul style="list-style-type: none"> Clearing and construction activities on the RoW 	<ul style="list-style-type: none"> Loss or alteration of previously identified and unidentified heritage or palaeontological resources 	Y	
	Traditional Land and Resource Use	<ul style="list-style-type: none"> Clearing, topsoil stripping, grading, trenching and backfilling along the RoW, at the Hardisty B terminal, and at the sites of proposed pumping facilities. Operation of equipment and vehicles during construction. 	<ul style="list-style-type: none"> Loss or alteration of traditional Aboriginal sites Disruption of, or inability to carry on, traditional activities 	Y	Y

Environmental Element	Description of Interaction (How, When, Where), or why no interaction is expected	Potential Adverse Environmental Effect	Standard Mitigation to be Implemented (See section 8.3) and/or reference for Further Detailed Assessment
Socio and Cultural Well-being	<ul style="list-style-type: none"> Interference to navigation from construction, operation and decommissioning of pipeline, temporary bridge crossings and hydrostatic testing AB and SK communities in the vicinity of the project already host existing oil company activities and facilities Little or no additional stress expected on the social infrastructure in the area Transportation effects will be minimal 	<ul style="list-style-type: none"> Navigation impacts on waterways and safety No potential for adverse effects 	Y
Human Health/Aesthetics	<ul style="list-style-type: none"> Decreased air quality during construction, operation and maintenance (refer to Air Quality section above) Construction activities could impact potable water (refer to Water Quality and Quantity sections above) Increased noise levels during operations from pump stations, including Grassy Creek and Bindloss pump stations Visual and light impacts from pump stations 	<ul style="list-style-type: none"> Health effects on local residents from decreased air quality Health effects on local residents associated with impacts to water wells Health effects on local residents from changes to the acoustic environment as a result of pump station operations 	Y Y (Refer to section 8.4.8 for details)
Accidents / Malfunctions	<ul style="list-style-type: none"> Spill or leak from damage and rupture to the facilities or equipment during construction and operations Failure of watercourse crossing methods 	<ul style="list-style-type: none"> Nuisance-related project effects on local residents from light pollution Soil, water and groundwater contamination See Water quality and quantity and Fish and Fish habitat elements 	Y
Effects of the Environment on the Project	<ul style="list-style-type: none"> Severe weather conditions such as heavy precipitation, winds, blizzards, and thunderstorms could cause flooding, erosion trench wall slumping and unstable ground conditions 	<ul style="list-style-type: none"> Delay of construction Affect the operations of the Project Damage to infrastructure 	Y

Legend: Y (Yes); N (No); U (Uncertain); P (Positive); Nil (Neutral); Adv (Adverse)

8.3 Standard Mitigation

The standard design and routine mitigation measures to be used to address potential adverse environmental and socio-economic effects from the Project identified in Table 8.2 are presented in Keystone's Environmental and Socio-Economic Assessment (ESA), subsequent submissions and Environmental Alignment Sheets. In addition, Keystone compiled its proposed mitigation measures including standard measures into a draft Environmental Protection Plan (EPP).

Several mitigation strategies have been and would be used to avoid or minimize the effects of the Project, including

- avoidance of valued ecosystem components through route selection;
- following existing RoW to minimize new disturbances;
- scheduling of activities to avoid sensitive periods;
- inspection during construction to ensure mitigation is implemented and effective; and
- system monitoring and maintenance activities to prevent impacts from any potential accidents during the operation of the pipeline system.

These measures have provided the Board with a sufficient basis to assess the potential adverse environmental effects and meet the objective of mitigating potential adverse environmental effects.

A standard mitigative measure is a specification or practice that has been developed by industry, or prescribed by a government agency, that has been previously employed successfully, and meets the expectations of the NEB.

To ensure that all standard mitigations measures, as well as others, are included and compiled together to ensure their effective implementation and are consulted on, the Board recommends that Keystone resubmit a revised and updated EPP as per Condition K. The Board recommends Condition M in order to ensure that all standard mitigation measures are followed with respect to heritage resources.

The NEB is of the view that for this Project, if Keystone follows the standard design and mitigative measures proposed and committed to in its application and during the public hearing process, then those potential adverse environmental effects which can be mitigated solely through standard mitigation are not likely to be significant.

8.4 Detailed Analysis of Potential Adverse Environmental Effects

The following section provides a detailed analysis for each potential adverse environmental effect which, is of public concern, or involves a monitoring or follow-up program, or requires non-standard mitigation measures, or necessitates implementation of an issue-specific recommendation.

Each analysis provides a background, specific mitigation measures, monitoring and/or follow-up programs, describes the views of the NEB along with any issue-specific recommendations, and provides ratings for the criteria used in evaluating significance.

8.4.1 Wildlife, Wildlife Habitat and Faunal Species at Risk

Issues	<ul style="list-style-type: none"> ▪ Loss and alteration of habitat; ▪ Sensory disturbance to nesting birds; ▪ Disturbance to SARA listed amphibians and reptiles; and ▪ Disturbance to SARA listed mammals.
Background	<p>Adverse effects on wildlife and wildlife habitat during construction and operation include mortality risk, changes in habitat availability due to vegetation clearing and indirect effects such as sensory disturbance and habitat connectivity. Certain species, such as rattlesnakes and amphibians could fall into the trench during construction and become trapped.</p> <p>The pipeline RoW intersects two locations with Ord's Kangaroo Rat populations. Keystone adjusted the route to avoid known dens of Ord's Kangaroo Rats. Keystone has also adjusted the route to meet the 500m setback from a Burrowing Owl nest at SE-10-013 24W3 (KP 354) as recommended by SE and EC.</p> <p>EC noted that there are three additional Burrowing Owl burrows in the Prairie dog colony and recommended Keystone to maintain the 500m setback and undertake appropriate surveys.</p> <p>The Project RoW is approximately 200 m from a Black-tailed Prairie Dog colony located on the Masfield PFRA pasture. The Masfield pasture has been preliminary identified as critical habitat for Swift Fox. EC noted that all the Prairie Dog colonies are listed as critical habitat under SARA for Black-footed Ferret. EC recommended that the pipeline be re-routed around the Masfield pasture and to minimize disturbance of native prairie. AAFC commented that new pipeline installations should have minimal impact on pasture operations and environment and acknowledged that the proposed route for the Keystone XL pipeline follows the existing right of way of the Foothills pipeline and would minimize disturbances of native prairie on community pasture.</p> <p>Furthermore, SE evaluated three routing options in relation to the Black-tailed Prairie Dog colony and concluded the proposed route would have less overall impact on native vegetation and habitat for all species, including species at risk, than would establishing a new RoW in order to avoid the colony. SE recommended that a detailed plan, including a traffic management plan, be developed to minimize activity within the 500 m buffer zone for the Black-tailed Prairie Dog colony.</p> <p>Keystone, during the oral public hearing, committed to consult with Environment Canada regarding options to avoid impacts to the Black-tailed Prairie Dog colony in Masfield pasture.</p> <p>Keystone has a number of field surveys still to be completed in order to identify wildlife and wildlife habitat and to develop further mitigation measures.</p>
Mitigation Measures	<ul style="list-style-type: none"> ▪ Mitigation measures would include adherence to timing restrictions on construction and clearing activities during the nesting season for migratory birds and setback distances. Where setback distances cannot be met, timing restrictions would ensure pipeline construction occurs during non-sensitive periods. In the event of construction and clearing activities within restricted activity periods for migratory birds, Keystone would undertake a pre-construction survey to ensure that no nests are destroyed or disturbed by construction activity. ▪ Keystone will frog-proof the wetlands and riparian areas where sensitive amphibian species have been identified, specifically Northern Leopard Frogs and Great Plains Toads. Keystone also commits to trenchless construction methods where threatened or endangered SARA listed species are identified or where standard mitigation is not sufficient to achieve protection. ▪ Keystone committed to consult with the appropriate regulatory agencies (e.g. AENV, AAFC, SE and EC) regarding the results of the additional field surveys and proposed mitigations. Mitigation measures will be reflected in the revised EPP and environmental alignment sheets which will be filed with the Board.

Monitoring	Keystone has committed to undertake post-construction surveys in the year following completion of construction where the Project is constructed within the recommended regulatory setback for SARA listed species.				
Views of the NEB	<p>The NEB recognizes that there is potential for the Project to disturb SARA listed species, species of special status, and birds protected by the <i>Migratory Birds Convention Act</i>.</p> <p>In order to verify appropriate protection of species at risk and to confirm that sufficient consultation has taken place with SE, AAFC, AENV and EC regarding mitigation, the following conditions would be recommended for inclusion in any approval granted to Keystone.</p> <p>Condition D: file methodology for conducting the surveys</p> <p>Condition E: file the results of the surveys, mitigation plan for each of the species and evidence of consultation with appropriate provincial and federal agencies.</p> <p>Condition I: additional environmental surveys committed to in Keystone's 28 August 2009 supplemental evidence.</p> <p>Condition O: pre-construction surveys to identify any migratory birds in the event of construction or clearing activities within restricted activity periods.</p> <p>Condition K: file traffic management plan as part of EPP to minimize total activity within 500 m buffer zone of Black-tailed Prairie Dog colony.</p> <p>Condition P: Post-Construction Environmental Monitoring</p> <p>The Board expects Keystone to consult with EC regarding avoiding impacts to the Prairie Dog colony and undertaking surveys for the Burrowing Owl species identified by EC within the Masfield colony.</p> <p>The Board is of the view that given the implementation of the above conditions and Keystone's proposed mitigation measures, any potential effects on wildlife and wildlife habitat, including SARA faunal species are not likely to be significant.</p>				
Evaluation of Significance	Frequency	Duration	Reversibility	Geographical Extent	Magnitude
	Multiple/Frequent	Short term	Reversible	RAA	Low
	Adverse Effect				
	Not likely to cause significant adverse environmental effects				

8.4.2 Rare Plants, Rare Ecological Communities, SARA Plant Species and Native Vegetation

Issues	<ul style="list-style-type: none"> Fragmentation and direct loss of, native vegetation, rare plants, rare ecological communities and SARA listed plant species Spread of weeds and non-native invasive species Appropriateness of seed mixes and reclamation measures
Background	<p>Clearing and construction of the pipeline has the potential to result in fragmentation and direct loss of valued components of native vegetation. Weeds and non-native species could become established and compete against native vegetation or hinder reclamation efforts.</p> <p>As part of addressing such impacts, Keystone committed to undertake several additional field surveys pertaining to rare plants, SARA listed plant species, and weeds and to developing site-specific mitigation plans to be incorporated into the Project EPP. With respect to the loss of rare plants and ecological communities, Keystone submitted that where this cannot be avoided, it would target a loss of no more than five percent.</p> <p>SE expressed concerns regarding the width of stripping in native prairie and asked that this be minimized as much as practical. SE also emphasized the importance of conducting pre-construction weed surveys and it provided recommendations on weed management.</p>

Mitigation Measures	<p>In addition to routing the Project immediately adjacent to other existing RoWs as much as possible to reduce overall fragmentation, Keystone also proposed the following measures specifically to reduce effects on rare plants, rare ecological communities, SARA plant species and native vegetation:</p> <ul style="list-style-type: none"> ▪ Narrowing the RoW or re-routing. ▪ Restrict topsoil stripping and RoW grading in areas near SARA-listed plants and limit blade width or ditch line width where practical. ▪ Establish additional cleaning stations to prevent the introduction of noxious or non-native invasive species from other areas along the pipeline RoW. ▪ Consult with provincial and federal agencies to refine mitigation plans and appropriate seed mixes for reclamation of native vegetation areas. ▪ Evaluate opportunities or options to offset cumulative effects on rare plant or rare plant communities.
Monitoring	<p>A long-term monitoring and research program for SARA-listed plant species and monitoring of rough fescue grasslands is in place on the existing Keystone Pipeline Project. Keystone has committed to apply the results of the monitoring and research program from the existing pipeline Project to the Keystone XL Project.</p>
Views of the NEB	<p>The NEB notes that rare plants are identified and listed as such precisely because they are already significantly impacted and need specific protection. Consequently, any further loss would leave the species no less significantly impacted, regardless of whether losses from any particular project are minor.</p> <p>The Board notes that Keystone's identification of a five percent loss as an acceptable threshold is adapted from the Alberta Native Plant Council's Guidelines for Rare Plant Surveys. The Board is of the view that it is inappropriate to apply such a survey criterion to other activities such as this Project, since repeated five percent losses of rare species, already significantly impacted, are potentially significant. In such circumstances it is imperative that a proponent either provide certain, lasting, and effective mitigation to achieve no loss, or provide sufficient offsets to compensate any loss. Consequently the NEB recommends Condition G. As part of an offset plan required by Condition G, the Board would expect Keystone to include a discussion of options available, criteria for selecting among the options, an implementation plan including criteria for measuring effectiveness and consultation with EC.</p> <p>Concerning Keystone's pre-construction surveys for rare and SARA-listed plants and rare ecological communities, the Board recommends that Keystone file, the methodology, prior to conducting the surveys, and the results of the surveys and detailed mitigation, as described in Conditions D and F. The Board expects Keystone to consult with EC as part of Condition F.</p> <p>The Board recognizes that noxious, restricted and invasive weeds are of concern, especially in native rangeland. In order to ensure that the weed surveys are conducted appropriately, that implementation of weed control is effective and that expert government departments are consulted, the Board recommends the filing of: a pre-construction weed surveys as described in Condition J, and a weed management plan as part of its EPP, as required in Condition K(a)(iii).</p> <p>To ensure that seed mixes and criteria for their use in reclamation are properly selected and appropriate regulatory agencies have been consulted, the Board recommends Condition K (a)(i).</p> <p>Finally, with respect to the base Keystone research and monitoring program for SARA-listed plant species and rough fescue grasslands, and how it would be applied to the reclamation of this Project, the Board is unclear from the evidence presented during the oral hearing how the results would be applied. The NEB therefore recommends as per Condition F(b)(ii) that the detailed mitigation plan, for rare and SARA listed plants and rare ecological communities, also include measures and a monitoring survey protocol for post-construction reclamation.</p>

Evaluation of Significance	Frequency	Duration	Reversibility	Geographical Extent	Magnitude
	Multiple/Frequent	Medium term	Possible	PDA	Moderate
	Adverse Effect				
	Not likely to cause significant adverse environmental effects				

8.4.3 Fish and Fish Habitat

Issues	<ul style="list-style-type: none"> Loss of drilling mud and cuttings to surface water due to failure of an HDD or HD bore.
Background	<p>Keystone would use trenchless methods for the crossing of the four main watercourses, the South Saskatchewan, Red Deer and Frenchman rivers and Piapot Creek. All remaining watercourses would be crossed using an isolated method approach outside the restricted activity period or using an open-cut method when the watercourses would be dry or frozen.</p> <p>The contingency method for Red Deer river, Frenchman river and Piapot creek is an isolated crossing and has been prepared.</p> <p>Subsequent to its application filing, Keystone submitted that an alternative to primary crossing location for South Saskatchewan River is being evaluated to 1) avoid SARA listed plant and wildlife species; 2) minimize traversing through native prairies; and 3) preclude constructability issues. The contingency crossing location for South Saskatchewan river will be outside the 1 km corridor and studies are currently being undertaken to finalize the contingency crossing location and method.</p> <p>Keystone committed to undertake all 16 watercourse crossings in accordance with DFO terms and conditions, including <i>DFO's Operational statement for isolated or dry open-cut stream crossings for SK and AB</i>. In the event where site or engineering considerations prohibit a crossing from being completed in accordance with DFO's terms and conditions, Keystone would submit detailed plans and would adhere to any letter of advice or authorization by DFO for the crossing.</p>
Mitigation Measures	<p>In addition to standard mitigation measures, the following best management practices would be implemented to prevent deleterious substances from entering the watercourses:</p> <ul style="list-style-type: none"> An environmental inspector or fisheries biologist/technician would be present to monitor construction at all watercourse crossings. Grading would be delayed on approach slopes to watercourses until immediately before construction. Appropriate temporary erosion and sediment control structures would be installed, where grading could not be delayed. Fish would be rescued from isolated watercourse crossings before dewatering and would be released into an unaffected reach of the watercourse. Keystone would comply with DFO's <i>Freshwater Intake End-of-pipe Fish screen Guideline</i> for use of pumps during any phase of trenched construction.
Monitoring	<ul style="list-style-type: none"> Water quality monitoring plans would be implemented at all crossing sites where there is potential for sediment introduction into surface water. Inadvertent mud release monitoring and response plans would be implemented at all HDD crossing sites. Reclamation measures would be monitored after completion of construction until vegetation has been established and the risk of sedimentation from erosion along the banks is eliminated.
Views of the NEB	<p>The Board is of the view that Keystone has committed to protect fish and fish habitat during the construction and operation of the Project. The NEB notes that Keystone is in the process of gathering site-specific information for evaluating both primary and contingency crossing location and contingency crossing method for the South Saskatchewan River and will file this information with the NEB.</p> <p>In order to ensure that any changes to proposed HDD or HD bore crossing methods are properly consulted on and mitigations are updated, the Board recommends:</p>

	<p>Condition C as described in section 8.7.</p> <p>Finally, the Board notes that should an HDD or HD bore crossing method fail and require implementation of contingency measures, Keystone would have to apply to DFO and TC who would review this in detail at that time. With respect to monitoring of reclamation measures, the Board expects Keystone to file this information as part of Condition P.</p>				
Evaluation of Significance	Frequency	Duration	Reversibility	Geographical Extent	Magnitude
	Accidental	Short term	Reversible	RAA	Moderate
	Adverse Effect				
	Not likely to cause significant adverse environmental effects				

8.4.4 Salt Affected Groundwater

Issues	<ul style="list-style-type: none">Management and disposal of salt affected groundwater																				
Background	<p>A supplemental monitoring program was undertaken by Keystone to assess groundwater quality and quantity of the area of brine plume. Although the maximum depth of the pipeline trench during construction is expected to be approximately 2.5 m below ground, the maximum depth of investigation for the monitoring program was selected to 1.2 m below ground.</p> <p>Keystone has committed to develop special trench water management procedures in areas where there is a likelihood of encountering shallow brine-impacted groundwater during pipeline construction.</p>																				
Mitigation Measures	<ul style="list-style-type: none">Shallow groundwater in the two km section of the pipeline trench would be field-tested for concentrations of electrical conductivity, total dissolved solids and chloride before it is pumped out. Where dewatered groundwater exceeds criteria, special trenchwater management practices would be developed prior to construction.Keystone would work with AENV to determine the options for management and disposal of trench water which may include off-site disposal at an approved facility and diversion of the trench water to Shorncliffe Lake.																				
Monitoring	Keystone would be undertaking further assessment of groundwater quality and quantity to delineate the plume and further evaluate the potential of encountering brine-impacted groundwater below 1.2 m.																				
Views of the NEB	<p>The NEB notes that Keystone will be undertaking further groundwater quality and quantity assessments in the area of the salt plume and will consult with AENV to discuss various mitigation measures.</p> <p>The NEB recommends the following condition to ensure that mitigation with respect to brine plume be developed, be consulted on and be included in the updated EPP, to ensure that there would not be any significant impacts to the environment:</p> <p>Condition K- special trenchwater management procedures in areas of brine plume.</p>																				
Evaluation of Significance	<table><tr><td>Frequency</td><td>Duration</td><td>Reversibility</td><td>Geographical Extent</td><td>Magnitude</td></tr><tr><td>Continuous</td><td>Medium term</td><td>Reversible</td><td>LAA</td><td>Moderate</td></tr><tr><td colspan="5">Adverse Effect</td></tr><tr><td colspan="5">Not likely to cause significant adverse environmental effects</td></tr></table>	Frequency	Duration	Reversibility	Geographical Extent	Magnitude	Continuous	Medium term	Reversible	LAA	Moderate	Adverse Effect					Not likely to cause significant adverse environmental effects				
	Frequency	Duration	Reversibility	Geographical Extent	Magnitude																
	Continuous	Medium term	Reversible	LAA	Moderate																
	Adverse Effect																				
Not likely to cause significant adverse environmental effects																					

8.4.5 Wetlands

Issues	▪ Loss or alteration of wetland communities and species				
Background	<p>Wetlands could be adversely affected during the construction and operation of the Project.</p> <p>Keystone stated that it recognizes the importance of the Federal Wetland Policy and the draft Alberta Wetland Policy and its associated goals and strategies, and that it has adopted the objective of no net loss of wetland function. Keystone added that it would achieve this by avoiding wetlands altogether or, where avoidance is not feasible, through mitigation strategies of soil conservation, invasive species management and reclamation using natural recovery.</p> <p>Avoidance of wetlands in areas where the proposed route was contiguous with existing pipeline corridors was not possible as this would result in increased land fragmentation.</p> <p>EC recommended that Keystone should provide a monitoring program to monitor the success of the wetland compensation to ensure wetland function can be restored and there is no net loss of wetland function. Keystone submitted that compensation within the hierarchical mitigation was not considered since pipeline crossings of wetlands are a temporary disturbance and the effects on wetlands are reversible and short-term in nature. Furthermore, Keystone stated that in the event post-construction monitoring determines that wetland reclamation has not been effectively achieved and there is some loss of wetland function, the need for compensation will be revisited.</p> <p>Keystone’s ESA did not provide a list of all the permanent wetlands and wetlands of high ecological value, nor of the crossing methods for each of those wetlands.</p> <p>Keystone has committed to conduct comprehensive wetland surveys to mark wetland zone boundaries and classification, characterize vegetation of each zone, identify wetland crossing methods and develop site-specific mitigation measures.</p> <p>Upon completion of the surveys, Keystone committed to review the results with the appropriate provincial and federal regulatory authorities.</p>				
Mitigation Measures	<p>Keystone would provide an update on the crossing methods and mitigation measures based on the results of the surveys and consultations with expert authorities.</p> <p>Keystone has submitted that trenchless construction methods for crossings of wetland or riparian areas will be considered where there is a SARA– listed species, specifically those classed as endangered or threatened; or where Keystone determines that standard mitigation is not sufficient to achieve the desired degree of protection.</p>				
Monitoring	<p>Keystone stated that compensation will be considered in the event that the post-construction monitoring determines that wetland reclamation has not been effectively achieved, and there appears to be some loss of wetland function.</p>				
Views of the NEB	<p>Given that the wetland surveys are not complete with respect to delineation of wetland boundaries, characterization of vegetation and mitigation methods, the Board recommends the following:</p> <p>Condition H- file with the Board a comprehensive wetland survey and an updated EPP with specific wetland mitigation measures and evidence demonstrating consultation with appropriate provincial and federal authorities, including EC.</p> <p>Since Keystone considers compensation to be contingent on the success of wetland reclamation, the Board expects Keystone’s mitigation plan for condition H to clearly describe the criteria for evaluating and monitoring the success of reclamation within the monitoring timeframe of condition Q and provide a protocol for how compensation would be addressed.</p>				
Evaluation of Significance	Frequency	Duration	Reversibility	Geographical Extent	Magnitude
	Multiple/Frequent	Medium term	Irreversible	LSA	Moderate
	Adverse Effect				
	Not likely to cause significant adverse environmental effects				

8.4.6 Atmospheric Environment - Operations Related Air Emissions from Hardisty B Tank Terminal

Issues	▪ Air emissions from the Hardisty B Tank Terminal				
Background	<p>Operations-related air emissions could be produced from evaporation of volatile components of the oil products contained in the tanks and could leak from the headspaces of the tanks. Air emissions could be greatest during tank-filling episodes when the vapour space inside the tanks is replaced with the product. These emissions would include Hydrogen sulphide (H₂S), Benzene and mercaptans that have the potential to cause nuisance odours and adverse human health effects.</p> <p>Keystone conducted dispersion modeling to predict ground level concentrations in and around the Hardisty complex and at sensitive receptor locations. Keystone stated that all air contaminants in the area within the Hardisty complex and at sensitive receptor locations would be below the relevant regulatory criteria for ambient air quality.</p> <p>Keystone did not consider emissions due to inspection and maintenance activities such as degassing and cleaning in the emission estimate calculations.</p>				
Mitigation Measures	<p>In addition to the standard mitigation measures outlined in the ESA and EPP, Keystone provided additional mitigative options to address any air quality issues that may arise during tank degassing and cleaning activities:</p> <ul style="list-style-type: none">▪ Develop formal operating procedures to schedule tank degassing and cleaning activities to manage odours.▪ Consider installing enhanced vapor controls on any critical tanks and if warranted, install a vapour collection and treatment or recovery system.▪ Manage the disposition of products so that the product with greatest emissions is stored in tanks at the centre of the terminal thereby allowing maximum atmospheric dispersion before the emissions reach the site boundary. <p>Keystone would incorporate “Best Available Technology that is Economically Achievable” (BATEA) to reduce and limit its air emissions from the storage tanks.</p>				
Monitoring	Keystone would participate in the ambient air quality program initiative for the airshed supported by AENV and the Hardisty Complex member operators. Keystone has been a participant in the Hardisty Complex Community Group since the approval of the TransCanada Keystone Hardisty A terminal and is committed to continual involvement in the Hardisty Complex Community Group.				
Views of the NEB	<p>The NEB notes that Keystone has proposed various mitigation measures to reduce potential air emissions primarily generated from the degassing and cleaning activities of the tanks.</p> <p>The Board is of the view that given the implementation of the above mitigation measures, any potential adverse environmental effects are not likely to be significant.</p>				
Evaluation of Significance	Frequency	Duration	Reversibility	Geographical Extent	Magnitude
	Multiple/Frequent	Short term to medium term	Irreversible	RAA	Moderate
	Adverse Effect				
	Not likely to cause significant adverse environmental effects				

8.4.7 Great Sand Hills Reclamation Plan

Issues	<ul style="list-style-type: none"> Erosion control in areas of sandy soil
Background	<p>The project traverses through the GSH area, a rare ecosystem. Although the Project is located more than 15 km away from the GSH Ecological Reserve core area.</p> <p>SE expressed concerns with respect to construction disturbance under non-frozen conditions, post-construction erosion control and invasion by weeds.</p>

	SE provided recommendations on stabilization of soils subsequent to construction and emphasized on a rapid return to pre-development conditions and conservation of native species. SE recommended that Keystone should involve Saskatchewan Agriculture, affected rural municipalities and the GSH Planning District in the development of reclamation plan.				
Mitigation Measures	In addition to standard mitigation measures for erosion control, Keystone committed to develop a detailed reclamation plan specific to the portion of the GSH traversed by the Keystone XL pipeline. Keystone agreed to SE’s recommendation to consult with the appropriate departments and stated that the experience gained from the reclamation research by TransCanada Pipelines Limited would be incorporated in the plan.				
Views of the NEB	To ensure that the GSH reclamation plan is adequate and effective, and that there would be no significant effects, the NEB recommends Condition K that Keystone file with the Board a detailed reclamation plan specific to the GSH in the EPP to address any concerns related to construction in areas of sandy soil.				
Evaluation of Significance	Frequency	Duration	Reversibility	Geographical Extent	Magnitude
	Multiple/Frequent	Medium Term	Reversible	PDA	Moderate
	Adverse Effect				
	Not likely to cause significant adverse environmental effects				

8.4.8 Increased Noise Levels During Operations

Issues	<ul style="list-style-type: none"> Potential health effects on local residents in close proximity to the Grassy Creek pump station from changes to the acoustic environment as a result of pump station operations
Background	<p>The Keystone ESA described the results of the assessment of potential effects on the acoustic environment and included a commitment to following the guidelines outlined in the Alberta Energy Resources Conservation Board's (ERCB) Directive 38 on noise. It also indicated that there were anomalies around the baseline measurement of the acoustic environment at the proposed location of the Grassy Creek pump station and, therefore, the predicted sound levels associated with the Application Case modeling scenario for the Grassy Creek pump station are slightly above the ERCB guidelines for Predicted Sound Level (night) at the receptor.</p> <p>Dale and Shirley McInnes, as intervenors, expressed concerns over the noise levels of the Grassy Creek pump station and the potential negative impacts that this would have on their health and quality of life.</p>
Mitigation Measures	Keystone committed to work with the McInnes to determine an acceptable solution to the noise concerns, either through mitigation or some other means short of relocating the Grassy Creek pump station.
Monitoring	Keystone indicated that it intends to do follow-up noise monitoring at all pump stations where landowners have expressed concerns over noise levels on a proactive rather than a complaint basis.
Views of the NEB	With respect to the noise level concerns raised by the McInnes, the Board notes that Keystone has committed to re-doing the noise assessments at the McInnes' residence to ensure that the noise levels from the pump station will, at minimum, be in accordance with ERCB Directive 38. To avoid potential discrepancies in noise assessment results, the Board directs Keystone to adhere to the methodological guidelines as outlined in ERCB Directive 38. The Board also anticipates that Keystone will consider noise mitigation measures in addition to Directive 38 in order to minimize, to every extent possible, noise levels affecting the McInnes' quiet enjoyment of their property.

	In order to facilitate the implementation of effective abatement strategies, including but not limited to the Grassy Creek pump station, the Board recommends Condition N pursuant to which Keystone shall maintain and file with the Board, upon request, a consultation and complaint monitoring report. The Board expects such a report to include: a chronological account of all landowner consultations, including all comments or concerns raised; all actions undertaken by Keystone to resolve each concern; and, a self assessment from Keystone determining whether it has achieved its stated consultation objectives for each concern.				
Evaluation of Significance	Frequency	Duration	Reversibility	Geographical Extent	Magnitude
	Continuous	Long Term	Reversible	LAA	Moderate
	Adverse Effect				
	Not likely to cause significant adverse environmental affects.				

8.5 Cumulative Effects Assessment

The assessment of cumulative effects entails considering the impact of the residual effects associated with the Project in combination with the residual effects from other projects and activities that have been or that are likely to be carried out, within the appropriate temporal and spatial boundaries and ecological context.

A Project inclusion list was developed by Keystone to allow an assessment of cumulative effects of the Project in combination with other Projects or activities that have been or will be done. Past projects were also captured within the baseline of the environmental assessment for each of the various valued ecological components. Keystone's ESA provides additional details on its cumulative effects assessment methodology.

Other existing project facilities in proximity to the Project and with residual effects that may interact with the Keystone XL Project include:

- the existing Keystone Pipeline, for a segment in AB from the southeast corner of Gooseberry Lake to the SK border;
- the existing Foothills Pipeline in SK;
- existing, approved and planned storage tanks (89 in total) at the Hardisty complex; and
- pump station associated with existing TransCanada Keystone Hardisty A Terminal.

Potential cumulative effects include:

1) *Alteration, fragmentation and loss of native vegetation and wildlife habitat:*

Native vegetation along the Project route and in the RAA has already been altered due to past agricultural, industrial and residential development activities. The greatest change is likely cultivation and conversion of native range into pastures, resulting in loss of native prairie at a landscape level. In addition, other oil and gas developments, including drilling and pipeline projects in the area, also disturb native prairie, parkland habitat and species that inhabit these habitats.

Clearing for the Project has the potential to result in loss of native vegetation within the RoW, and fragmentation of the landscape where the RoW does not follow existing RoW. Project

construction activities also have the potential to affect reclamation efforts on the existing Keystone Pipeline project.

Although the Project would result in a widening of existing pipeline RoWs where the Project is contiguous with other RoWs, the RoWs would overlap by about 10 m thus reducing the potential loss of vegetation compared to if the Project were in an entirely separate RoW. Maximizing the length of contiguous RoW also acts to substantially reduce overall landscape fragmentation.

Keystone predicted that the Project's contribution to loss of native vegetation is low and will not affect the viability or sustainability of wildlife and wildlife habitat. Keystone submitted that these effects could be minimized through the implementation of proper mitigation measures.

2) *Loss of rare plants and ecological communities*

Construction of the pipeline has the potential to result in direct loss of rare plants and ecological communities.

As with the alteration and loss of native vegetation above, perhaps the greatest source of past impacts on rare plants and ecological communities is the landscape level change in land use brought about through cultivation and the conversion of native range into pastures. Other human activities and developments have also had a role.

Keystone indicated that its preferred approach is to avoid new disturbances affecting SARA plant species, rare plants or rare ecological communities and has considered them in route design and planning process. Where avoidance of direct effects on rare plants and ecological communities is not possible, Keystone proposed a target of no more than a 5% loss of the immediate population of rare plants and rare ecological communities. This is further discussed in section 8.4.2.

3) *Increase in air contaminants*

Cumulative environmental effects might result from the release of air contaminants from the Keystone XL Hardisty B terminal, in combination with air contaminants from existing, approved, and publicly disclosed future planned developments at Hardisty, resulting in increased concentrations. Keystone conducted dispersion modeling to predict ground-level concentrations of H₂S, Benzene and Mercaptans. Although the Project contribution to the total residual cumulative environmental effect would result in an increase of maximum predicted ground-level concentrations ranging from 0.002 to 32.7 % higher than those associated with the Baseline case, all the predicted concentrations were below the relevant regulatory criteria for ambient air quality.

Keystone would ensure compliance with regulatory air quality guidelines during the construction and operation phases of the Project. Keystone's ESA indicated that with the implementation of mitigation and environmental protection measures, the effect of the Project on the atmospheric environment is considered to be not significant. Keystone stated that it is committed to participate in the ambient air quality monitoring program for the Hardisty airshed.

4) *Increased Cumulative Noise Levels at Hardisty and at Pump Station Sites*

Keystone identified a number of other existing, or future likely developments with potential noise emissions and which may occur within 1.5 km of Project noise sources at Hardisty and at the pump stations.

The predicted sound levels for all pump stations associated with the project in combination with other projects located within 1.5 km of the project are below the relevant regulatory guideline except for Grassy Creek Pump Station. Keystone indicated that there were data abnormalities in baseline sound measurement for the Grassy Creek pump station and that it would conduct follow-up monitoring.

Modelling of the residual and cumulative noise levels predicted that levels would remain within regulatory guidelines and are not considered to be significant.

Views of the Board

The Board is of the view that the cumulative effects assessment presented by Keystone for the Project fulfills the requirements outlined in the Scope of the Factors for the Project.

With respect to the potential loss of rare plants and communities, the Board finds that losses of plant species or ecological communities that are already listed as rare is potentially significant. Consequently the Board recommends, as described in section 8.4.2, that Keystone either achieves no loss, or that it provide sufficient offsets to compensate for any loss.

The Board is of the view that taking into consideration Keystone's Project-specific environmental protection and mitigation measures and the recommendations referred to in section 8.7, the Project would not likely result in significant adverse cumulative environmental effects in combination with other projects or activities that have been or will be carried out.

8.6 Follow-up Program

The Project and its associated activities are generally routine in nature and the potential adverse environmental effects of the Project are expected to be similar to those of past projects of a similar nature in a similar environment. For this reason, the NEB is of the view that a follow-up program pursuant to the CEA Act would not be appropriate for this Project.

The Board understands that other RAs may rely on the NEB EA report to the extent possible but may produce an appendix to the EA report if necessary. Other RAs will provide their respective determinations and may conduct a follow-up program to ensure that mitigation measures related to their areas of responsibility identified through EA, and any conditions attached to licenses and approvals, are effectively implemented.

8.7 Recommendations

The following are recommended conditions that may form part of any regulatory decision on the proposed Project under the NEB Act. Conditions A, B & Q are standard conditions that appear in most Board authorizations.

Definition for the Commencement of Construction means: clearing of vegetation, ground-breaking and other forms of right-of-way preparation that may have an impact on the environment, but does not include activities associated with normal surveying operations.

- A. Keystone shall implement or cause to be implemented all of the policies, practices, programs, mitigation measures, recommendation and procedures for the protection of the environment included in or referred to in its application or as otherwise agreed to during questioning in the OH-1-2009 proceeding or in its related submissions.
- B. Keystone shall maintain at its construction office(s):
 - a) an updated Environmental Commitments Tracking Table listing all regulatory commitments, including but not be limited to all commitments resulting from:
 - i) the NEB application and subsequent filings;
 - ii) undertakings made during the OH-1-2009 proceedings; and
 - iii) conditions from permits, authorizations and approvals.

Keystone shall also file the updated Environmental Commitments Tracking Table, with the Board 15 days prior to construction.

- b) copies of any permits, approvals or authorizations for the applied-for facilities issued by federal, provincial or other permitting agencies, which include environmental conditions or site-specific mitigative or monitoring measures; and
 - c) any subsequent variances to any permits, approvals or authorizations.
- C. Keystone shall file with the Board either:
 - a) upon successful completion of the Horizontal Directionally Drilled (HDD's) or HD bore watercourse crossing for the Red Deer, South Saskatchewan, and Frenchman Rivers and Piapot Creek, confirmation of their completion; or
 - b) in the event of any changes to the proposed HDD/HD bore watercourse crossing method for the Red Deer, South Saskatchewan or Frenchman Rivers or Piapot Creek, at least 10 days prior to crossing,
 - i) notification in writing of such change to the proposed crossing method and the reason for that change;
 - ii) evidence of consultation with appropriate provincial and federal regulatory authorities that have an interest in the watercourse crossings and provide copies of all relevant correspondence from them; and
 - iii) file for approval, at least 10 days prior to implementing the revised watercourse crossing method, a description of: 1) amended reclamation and re-vegetation

measures; 2) amended mitigation measures for the protection of Aboriginal heritage and traditional resources; and 3) fish and fish habitat monitoring for the affected watercourse crossings.

D. Keystone shall file with the Board for approval, at least 60 days prior to starting each pre-construction survey:

- a) a methodology for conducting the surveys for rare and SARA listed plants and rare ecological communities;
- b) a methodology for conducting the confirmatory surveys for faunal species of management concern (including Ord's Kangaroo Rat, Swift Fox, Ferruginous Hawk, Burrowing Owl, Black-tailed Prairie Dog, sharp tailed grouse, loggerhead shrike and SARA listed amphibians); and
- c) evidence of consultation on the above methodologies with appropriate provincial and federal regulatory authorities and provide copies of correspondence from these regulatory authorities regarding the methodology.

E. Keystone shall file with the Board for approval, at least 60 days prior to construction:

- a) the results of the confirmatory surveys for species of management concern, including Ord's kangaroo rat, swift fox, ferruginous hawk, burrowing owl, black tailed prairie dog, sharp tailed grouse, loggerhead shrike and SARA listed amphibians;
- b) a detailed mitigation plan for each of the above species affected by construction and operation activities;
- c) evidence of consultation with appropriate provincial and federal regulatory authorities and copies of correspondence from these regulatory authorities regarding satisfaction with the proposed mitigation; and
- d) confirm that the EPP has been updated to include the mitigation measures.

Construction shall not commence until Keystone has received approval of its SARA survey results and mitigation plans from the Board.

F. Keystone shall file with the Board for approval, at least 60 days prior to construction:

- a) the results of the surveys for rare and SARA listed plants and rare ecological communities;
- b) a detailed mitigation plan for each of these species affected by construction activity, including but not limited to:
 - i) measures to be implemented during construction;
 - ii) measures and a monitoring survey protocol for post-construction reclamation; and

- iii) a survey methodology for determining the extent of non-avoidable impacts on rare and SARA listed plants and rare ecological communities.
- c) evidence of consultation with appropriate provincial and federal regulatory authorities and copies of correspondence from these regulatory authorities regarding satisfaction with the proposed mitigation plan; and
- d) confirmation that the EPP has been updated to include the relevant mitigation measures.

Construction shall not commence until Keystone has received approval of its SARA survey results and mitigation plans from the Board.

- G.** Keystone shall file with the Board for approval, at least 120 days prior to leave to open, a plan for the provision and implementation of offset measures for all non-avoidable impacts on rare and SARA listed plants and rare ecological communities. The plan shall include but not be limited to, the results from surveys for determining the extent of non-avoidable impacts, and evidence of consultations with appropriate government agencies and relevant stakeholders.
- H.** Keystone shall file with the Board for approval, at least 60 days prior to construction, a comprehensive wetland survey. The survey shall include:
 - a) the methodology for conducting the survey;
 - b) the results of the survey;
 - c) the criteria, and the rationale for the criteria, for the crossing methods and mitigation measures to be employed;
 - d) evidence demonstrating consultation with appropriate provincial and federal regulatory authorities; and
 - e) confirmation that the EPP has been updated to include the mitigation measures.
- I.** Keystone shall file with the Board for approval, at least 60 days prior to construction, additional surveys and assessments committed to in its 28 August 2009 Supplemental evidence necessary to address facility location and route changes extending beyond the 1 km wide study corridor assessed for the ESA.

The surveys and assessments shall include:

- a) the methodology for conducting the surveys (for those methodologies not otherwise conditioned);
- b) the results of the surveys;
- c) mitigation measures;

- d) evidence of consultation with appropriate provincial and federal regulatory authorities; and
 - e) confirmation that the EPP has been updated to include the mitigation measures.
- J.** Keystone shall file with the Board for approval, at least 60 days prior to construction:
- a) the results of the pre-construction weed surveys to identify the presence and density of weeds in areas that will be affected by the construction of the Keystone XL pipeline;
 - b) the methodology for conducting the surveys;
 - c) evidence demonstrating consultation with appropriate provincial and federal regulatory agencies regarding the methodology and results; and
 - d) confirmation that the EPP has been updated to include the mitigation measures.
- K.** Keystone shall file with the Board for approval:
- a) at least 90 days prior to the commencement of construction, a draft Project-specific Environmental Protection Plan (EPP). The EPP shall be a comprehensive compilation of all environmental protection procedures, mitigation measures, and monitoring commitments, as set out in Keystone's application for the Project, subsequent filings or as otherwise agreed to during questioning in the OH-1-2009 proceeding or in its related submissions. The EPP shall also include measures arising from additional studies conducted in 2009 & 2010 with updated Environmental Alignment Sheets. The EPP, as appropriate, shall include but not be limited to:
 - i) seed mixes and criteria for their use in the reclamation of the project and confirmation that appropriate provincial and federal regulatory agencies have commented on the proposed seed mixes;
 - ii) evidence that landowners have been consulted on seed mixes to be applied to their directly affected land;
 - iii) an updated Weed Management Plan, including evidence demonstrating consultation with appropriate provincial and federal regulatory agencies, and directly affected landowners in developing the plan;
 - iv) a Great Sand Hills Reclamation plan for pipeline construction, developed in consultation with appropriate provincial and federal regulatory agencies;
 - v) a Traffic Management Plan to minimize total activity including, where relevant, construction within a 500 m buffer zone of Prairie dog colonies; and
 - vi) special trenchwater management procedures in areas where there is a likelihood of encountering shallow brine-impacted groundwater during dewatering for pipeline construction.

- b) at least 45 days prior to the commencement of construction, a final EPP for approval, which shall include but not be limited to, updated mitigations and any other updates resulting from survey results, and any changes resulting from consultation on the previous draft EPP. Keystone shall also provide evidence of consultations and describe how any outstanding concerns will be addressed.

Construction shall not commence until Keystone has received approval of its EPP.

- L.** Keystone shall continue to consult with Aboriginal groups who have expressed interest in the Project regarding the details of construction phase of the project as well as its plan for monitoring procedures for the protection of Aboriginal heritage and traditional resources. Keystone shall file with the Board, at least 60 days prior to the commencement of construction, an update on its consultations with Aboriginal people, including:
 - a) concerns raised by Aboriginal people;
 - b) a summary indicating how Keystone will address any concerns raised during these consultations; and
 - c) its plan describing monitoring procedures for the protection of Aboriginal heritage and traditional resources during construction.
- M.** Keystone shall file with the Board, at least 30 days prior to commencement of construction.
 - a) a copy of clearance received under the Alberta Historical Resources Act;
 - b) all comments and recommendations received from the provincial authorities in SK and AB regarding the Heritage Resources Impact Assessments; and
 - c) for approval, the mitigation measures that Keystone proposes to address the comments and recommendations in b).
- N.** For the duration of construction and for a period of at least five years following leave to open, Keystone shall maintain and upon request file with the Board a construction consultation and complaint monitoring report that provides a Landowner Consultation Tracking Table that will include, but not be limited to:
 - a) a description of any landowner consultations undertaken including the method of consultation, dates, and a summary of any comments or concerns raised by landowners or potentially affected persons or groups;
 - b) a summary of actions undertaken by Keystone to address each of the comments or concerns raised by potentially affected persons or groups; and
 - c) a description of how Keystone intends to measure whether and to what extent it is achieving its stated objectives regarding consultation.

- O.** In the event of construction or clearing activities within restricted activity periods for migratory birds, Keystone shall retain a qualified avian biologist to carry out a pre-construction survey to identify any migratory birds and active nests in areas immediately surrounding the site (30 metres for migratory birds and 100 metres for raptors) and shall file with the Board within 15 days following the construction or clearing activities:
- a) the results of the survey;
 - b) mitigation, including monitoring, developed in consultation with Environment Canada and Canadian Wildlife Service, to protect any identified migratory birds or their nests;
 - c) mitigation, including monitoring, developed in consultation with Environment Canada and Canadian Wildlife Service to protect any identified *Species at Risk Act* birds or their nests; and
 - d) evidence to confirm that the appropriate provincial and federal regulatory authorities were consulted, on the proposed methodology for the survey, the results from the survey and the mitigation and monitoring to be used, and a description of any outstanding concerns they may have.

If no construction or clearing activities occur within restricted activity periods for birds, Keystone shall notify the Board of this within 15 days following the last restricted activity period to occur during construction.

- P.** Keystone shall file with the Board, 6 months after the commencement of operation, and on or before the 31st January for each of the subsequent 5 years, a post-construction environmental monitoring report that:
- a) describes the methodology used for monitoring, the criteria established for evaluating success and the results found;
 - b) assesses the effectiveness of the mitigation measures applied during construction against the criteria for success;
 - c) identifies deviations from plans and alternate mitigation applied as approved by the Board;
 - d) identifies locations on a map or diagram where corrective action was taken during construction and the current status of corrective actions; and
 - e) provides proposed measures and the schedule Keystone shall implement to address any unresolved concerns.
- Q.** Keystone shall comply with all of the conditions contained in this Certificate unless the Board otherwise directs.

9 THE NEB'S CONCLUSION

The NEB has determined, pursuant to the CEA Act, that, if the Project is approved and taking into account the implementation of Keystone's proposed mitigation measures, compliance with the Board's regulatory requirements and the recommended conditions attached to the ESR, the construction and operation of the pipeline and associated facilities is not likely to cause significant adverse environmental effects.

This ESR was approved by the NEB on the date specified on the cover page of this report under the heading CEA Act Determination Date.

10 NEB CONTACT

Anne-Marie Erickson
Acting Secretary of the Board
National Energy Board
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Calgary, Alberta T2P 0X8
Phone: 1-800-899-1265
Facsimile: 1-877-288-8803
secretary@neb-one.gc.ca

APPENDIX 1:

DRAFT SCOPE OF ENVIRONMENTAL ASSESSMENT

**TransCanada Keystone Pipeline GP Ltd.
Proposed Keystone XL Pipeline
Draft Scope of the Environmental Assessment Pursuant to the
*Canadian Environmental Assessment Act***

1.0 INTRODUCTION

TransCanada Keystone Pipeline GP Ltd. (TransCanada) is proposing to construct and operate the Keystone XL Pipeline Project (the Project). This would require a Certificate of Public Convenience and Necessity pursuant to the section 52 of the *National Energy Board Act* (NEB Act). The Project would also be subject to an environmental screening under the *Canadian Environmental Assessment Act* (CEA Act).

On 18 July 2008, TransCanada filed a Project Description with the NEB regarding the proposed Project. The intent of the Project Description was to initiate the environmental assessment process (EA) pursuant to the CEA Act.

On 31 July 2008 the Board sent out a Federal Coordination Notification letter pursuant to section 5 of the CEA Act *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements* (Federal Coordination Regulations). In response, the following departments identified themselves either as a Responsible Authority (RA) likely to require an EA under the CEA Act or as a Federal Authority (FA) in possession of specialist or expert information or knowledge in respect of the proposed project EA:

- National Energy Board – RA
- Agriculture and Agri-Food Canada (AAFC) – RA
- Canadian Transportation Agency (CTA) – RA
- Transport Canada (TC) – RA
- Department of Fisheries and Oceans – FA
- Environment Canada – FA
- Natural Resources Canada – FA
- Health Canada – FA

AAFC, the CTA and TC's responsibilities will be defined relative to their particular triggers under the CEA Act.

The Provinces of Alberta and Saskatchewan also expressed an interest in monitoring and participating in the EA although Provincial EA legislation is not triggered.

This Scope of the EA was established by the RAs, after consulting with the FAs, in accordance with the CEA Act and the Federal Coordination Regulations.

On 27 February 2009, TransCanada filed an application with the NEB. The information contained within the application remains materially the same as that described in the Project Description.

2.0 SCOPE OF THE ASSESSMENT

2.1 Scope of the Project

The scope of the Project for the NEB as determined for the purposes of the EA includes the various components of the Project described by TransCanada in its 27 February 2009 Project Application submitted to the NEB. The physical activities include construction, operation, maintenance and foreseeable changes and, where relevant, the abandonment, decommissioning and site rehabilitation relating to the entire Project, including the following physical works described in greater detail in TransCanada's Project Description:

Pipeline

Approximately 525 km of new 914 mm outside diameter oil pipeline, extending from Hardisty, Alberta (AB) to the international border between Canada and U.S. near Monchy, Saskatchewan (SK), plus additional related facilities (see below). The pipeline would cross the AB-SK boundary near McNeill, AB, with about 266 km in AB and 259 km in SK. Approximately 475 km of the pipeline would be contiguous with existing pipeline right-of-way (RoW) and approximately 50 km would require new non-contiguous RoW.

Construction is proposed to begin in mid-2010 and be completed in 2012.

Hardisty Terminal

Three operational storage tanks would be constructed at the pipeline terminal in Hardisty and would include the following ancillary facilities: an initiating pump station; metering facilities; control systems; and pipeline interconnections.

Pump stations

Seven additional intermediate pump stations consisting of three to five 5,200 kW (7,000 hp) electric-driven pump units, piping, control systems and related facilities would be required along the proposed pipeline, four in Alberta and three in Saskatchewan.

Other Facilities:

- Mainline valves
- Cathodic protection system
- In-line inspection facilities
- Permanent access roads for pump stations and valve sites
- Temporary infrastructure such as construction access roads, pipe storage sites, contractor yards and construction camps

Any additional modifications or decommissioning/abandonment activities would be subject to future examination under the NEB Act and consequently, under the CEA Act, as appropriate. Therefore, at this time, these activities will be examined in a broad context only.

AAFC, the CTA and TC have determined, based on their respective triggers under the CEA Act, that their scopes of project for the purposes of the EA will be:

- For AAFC, based on section 5(1)(c) of the CEA Act, any pipeline crossings of Prairie Farm Rehabilitation lands for which Keystone requires AAFC licenses;
- For the CTA, based on section 101(3) of the *Canada Transportation Act*, any pipeline crossings of federally regulated railway lines;
- For TC, based on the *Navigable Waters Protection Act* and section 108 of the NEB Act, any watercourse crossings (pipeline crossings and bridges) of navigable waterways.

These include all construction, operation, maintenance, modification, and decommissioning (including closure and reclamation) activities related to those project components.

2.2 Factors to be Considered

The EA will include a consideration of the following factors listed in paragraphs 16(1) (a) to (d) of the CEA act:

- (a) the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- (b) the significance of the effects referred to in paragraph (a);
- (c) comments from the public that are received in accordance with the CEA Act and regulations; and
- (d) measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project.

For further clarity, subsection 2(1) of the CEA act defines ‘environmental effect’ as:

- (a) any change that the project may cause in the environment, including any change that the project may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species as defined in the *Species at Risk Act*;
- (b) any effect of any change referred to in paragraph (a) on
 - i. health and socio economic conditions,
 - ii. physical and cultural heritage,
 - iii. the current use of lands and resources for traditional purposes by aboriginal persons,
 - iv. any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance; or
- (c) any change to the project that may be caused by the environment, whether any such change or effect occurs within or outside Canada.

2.3 Scope of Factors to be Considered

The EA will consider the potential effects of the proposed Project within spatial and temporal boundaries which the Project may potentially interact with, and have an effect on components of the environment. These boundaries will vary with the issues and factors considered, and will include but not be limited to:

- construction, operation, decommissioning, site rehabilitation and abandonment or other undertakings that are proposed by the Proponent or that are likely to be carried out in relation to the physical works proposed by the Proponent, including mitigation and habitat replacement measures;
- seasonal or other natural variations of a population or ecological component;
- any sensitive life cycle phases of wildlife species in relation to project scheduling;
- the time required for an effect to become evident;
- the time required for a population or ecological component to recover from an effect and return to a pre-effect condition, including the estimated degree of recovery;
- the area within which a population or ecological component functions; and
- the area affected by the Project.

For the purpose of the assessment of the cumulative environmental effects, the consideration of other projects or activities that have been or will be carried out will include those for which formal plans or applications have been made.

APPENDIX 2 COMMENTS ON THE DRAFT ESR

Agencies	Comments	Section in ESR where wording was modified	Explanation on why change was not made to the ESR
TC	TC specified revisions to existing wording on TC's mandate and scope of its analysis.	Revisions made to section 2.1	n/a
	TC recommended that the scope of the EA should be provided in the Appendix to the ESR	Added as an appendix to the ESR and revisions made to section 3.0	n/a
	TC suggested to include 'Wetlands' category and include a statement describing the proposed watercourse crossings in the 'Description of the Environment'	A new wetlands section was added to section 5.0 and navigable waterways were included in the Socio-Economic Environment	The proposed watercourse crossing methods are already included in Table 2
	TC suggested to include a statement that describes Keystone's ongoing terrestrial studies	n/a	This comment has already been addressed in section 8.4.1
	TC suggested to include a statement describing Keystone's on-going consultation efforts with interested Aboriginal groups in section 6.3	Revisions made to section 6.3	n/a
	TC specified revisions to the methodology of the NEB's EA that reflects section 2 of the CEA Act	n/a	Section 2 of the ESR specifies the EA is under the CEA Act and section 3 indicates that the scope is in accordance with the CEA Act
	TC proposed additions to section 8.2 – Project Environment Interactions	These comments were added to section 8.2	n/a
	TC recommended including a Condition that describes Keystone's commitment to file an update on its consultations with aboriginal people. TC also suggested to include effective measures to prevent or mitigate impacts and should be reflected in the updated EPP.	Condition L was added in section 8.7 and revisions were made to section 6.3	n/a
	TC stated that any alternatives or alterations to watercourse crossings must be reviewed and/or approved by the TC prior to commencement of construction	These comments are added to section 8.4.3	n/a
	TC stated that it may conduct a follow-up program to ensure that any conditions detailed in its authorization are carried out by Keystone.	Revisions made to section 8.6	n/a

Agencies	Comments	Section in ESR where wording was modified	Explanation on why change was not made to the ESR
	TC suggested to include 'amended mitigation measures for Aboriginal heritage and traditional resources' in the description for the affected watercourse crossings	Revisions made to Condition C (b) (iii)	n/a
EC	EC noted that there are three additional burrowing owl burrows in the prairie dog colony and that the proponent should maintain the 500 m setback and undertake appropriate surveys.	These comments were added to section 8.4.1	n/a
	EC raised concerns with the timing of the migratory bird surveys that need to be completed prior to construction or clearing within restrictive periods.	Revisions made to Condition O	n/a
	EC stated that appropriate SARA species specific setbacks should be observed and surveys should be undertaken accordingly.	n/a	As part of Condition O (d), Keystone will consult with EC on the proposed methodology for the survey, the results from the survey and the mitigation and monitoring to be used.
Keystone	Keystone specified revisions to section 8.4.1 regarding the use of frog proofing and trenchless construction methods.	Revisions made to section 8.4.1	
	Keystone proposed modifications to the recommended conditions to enable the filing of materials in advance of and with respect to, each of the major components of the Project.	n/a	This comment on the conditions was also made during the hearing. The Board considered it and is of the view that this would create an inordinate number of filings, unnecessary complexity in terms of tracking information provided in each filing and has the potential to miss information and commitments. Consequently the Board has decided to leave the relevant conditions as originally proposed.

APPENDIX Y


Pipeline Construction in Sand Hills Native Rangelands

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Pipeline Construction in

Sand Hills Native Rangelands





TransCanada is committed to restoring the productive capability of all lands disturbed by pipeline construction. We implement a comprehensive program from project planning, through construction, to reclamation and monitoring, in order to ensure that disturbances are reduced as much as possible, and to restore lands crossed by our projects to their pre-construction productivity.

Native rangelands are important ecosystems that support a variety of uses such as livestock grazing, wildlife habitat and recreational opportunities. With over 50 years of experience building and operating pipelines, TransCanada has successfully reclaimed thousands of acres of native rangeland on pipeline rights-of-way throughout North America. Included in these efforts are successful pipeline reclamation projects in the arid native prairie regions of southern Alberta and southwestern Saskatchewan, including areas such as the Great Sand Hills of Saskatchewan.

Although we are experienced at native rangeland reclamation, we recognize that native rangelands within the Sand Hills region of southern South Dakota and central Nebraska creates unique challenges.

The Sand Hills are an extensive and biologically significant ecoregion encompassing approximately 23,000 square miles in South Dakota and Nebraska. Soils are typically sandy and fragile, forming blowouts and bare dunes where vegetation is not properly managed. The Sand Hills are not a uniform landscape, but a collection of diverse habitats that vary from exposed wind-swept ridges and blow outs, to areas of soil deposition on the windward side of hills, with wet meadows and alkali lakes in valley bottoms.

During project scoping, TransCanada engaged in discussions with several regional experts on Sand Hills ecology and restoration at universities and government agencies, including experts at the University of Nebraska, the University of South Dakota, the Natural Resources Conservation Service (NRCS) and state road departments.



Best Management Practices

The following best management practices will be applied to the Keystone XL Project.

Right-of-Way Siting

- Incorporate minor route re-alignments through the Sand Hills region.
- Attempt to locate the right-of-way in areas of higher soil moisture and greater soil structure while avoiding wetlands to the maximum extent possible.
- Re-alignments will typically remain within the overall 300-foot study corridor.

Right-of-Way Construction

Note: The construction right-of-way will be 110-feet wide, with a 50-foot permanent easement and a 60-foot temporary construction easement.

- Provide training to construction crews and establish and apply an Access Control Plan in the Sand Hills to minimize impacts to this sensitive ecosystem. TransCanada will ensure that the plan considers: timing of construction, the reduction of traffic volumes, restriction of equipment and vehicle types, and alternative mitigation measures to address site-specific issues.
- Avoid disturbance of the fragile soils and native vegetation, to the extent practicable.
- Conduct topsoil salvage in all areas where grading and excavation occurs. Topsoil shall be conserved and stored separately from subsoil, typically in long windrows adjacent to the trench. Protect topsoil piles from erosion through the use of best management

practices such as applying water, matting, mulch or tackifier. Once the pipe has been laid, subsoil will be returned to the trench, and topsoil re-spread to the original contour of the land for reclamation.

Right-of-Way Reclamation

- Revegetate the right-of-way in areas of native rangeland by using native seed adapted to the Sand Hills. Use seed mixes that have been developed with input from the local NRCS offices and through collaboration with regional experts. Adjust seed application rates accordingly to complement the application methods, seed bed and terrain constraints.
- Ensure all seed is certified noxious weed free and calculated on a pure live seed (PLS) basis.
- Use straw or native prairie hay as mulch, applied to the right-of-way and crimped into the soil to prevent wind erosion. Ensure all mulch is documented as noxious weed free. Annual cover-crops may also be used to provide a vegetative cover to control erosion.
- Consider use of hodder gaugers or imprinters to create impressions in the soil, reducing erosion, improving moisture retention and creating microsites for seed germination.
- Use sediment logs (straw wattles) where appropriate to manage soil erosion issues in place of slope breakers (short terraces) that are constructed of soil.
- Apply photodegradable matting on steep slopes or areas prone to extreme wind exposure such as north- or west-facing slopes and ridge tops. Use biodegradable pins in place of metal staples to hold the matting in place.
- Take into consideration soil, vegetative and regional moisture constraints, and the landowner's livestock grazing management to evaluate the need to implement fencing of the right-of-way from livestock to hasten vegetation re-establishment. Incorporate management concerns such as livestock access to water or movement within a pasture into any decisions. Compensate landowners for any grazing restrictions experienced due to fencing.



Post Construction

- TransCanada is committed to post-construction monitoring and repair. Revegetation with native species typically requires several growing seasons to become fully established. We will monitor reclamation on the right-of-way for several years and repair areas of failure. During monitoring, we will make sure landowners are informed of our efforts and intentions.
- Noxious weeds are a concern for landowners and TransCanada. We have developed noxious weed management plans specific to each state crossed by our project. These plans have been developed in consultation with state and county experts. We are committed to preventing the spread of noxious weeds via the right-of-way. In areas such as the Sand Hills, we may implement alternative or less invasive control measures to reduce effects to the sensitive ecosystem.
- TransCanada will work with landowners to prevent unauthorized use of the right-of-way by ensuring that fences are adequately replaced and any new access roads established for construction are removed and reclaimed.

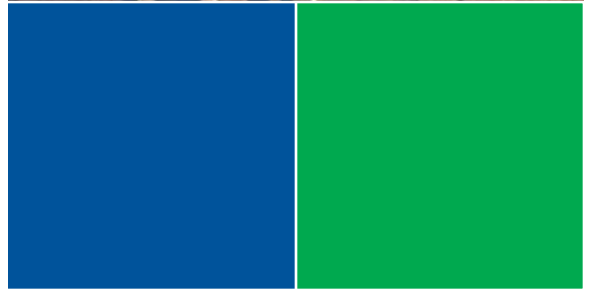
Pipeline Construction in **Sand Hills Native Rangelands**

About the Proponents

The Keystone Pipeline is a partnership between TransCanada and ConocoPhillips. TransCanada affiliates will construct and operate the pipeline.

ConocoPhillips is an international, integrated energy company with interests around the world. Headquartered in Houston, Texas, the company has approximately 32,600 employees and \$178 billion in assets. For more information, go to www.conocophillips.com.

TransCanada is a leader in the responsible development and reliable operation of North American energy infrastructure including natural gas pipelines, power generation and gas storage facilities. TransCanada's network of wholly owned pipelines extends more than 36,500 miles (59,000 kilometres), tapping into virtually all major gas supply basins in North America. TransCanada is one of the continent's largest providers of gas storage. TransCanada owns or has interests in approximately 10,900 megawatts of power generation in Canada and the United States. For more information, go to www.transcanada.com.



United States Department of State 4.3.1

Reference: Keystone XL Project Environmental Report
Soils

Request:

Can you confirm if experts from the University of Nebraska were consulted relative to the approach to construction in the Sand Hills area? Does the approach to construction in the Sand Hills area accommodate any changes to local climate? Are the proposed construction and restoration methods within the Sand Hills terrain still appropriate if during the life of the pipeline system, average rainfall in the Sand Hills area substantially increases or substantially decreases in response to climate change? Will grasslands in the Sand Hills be restored with native grasses?

Response:


Yes, experts at the University of Nebraska were consulted in July 2008 with regard to construction and reclamation in the Sandhills (see attached spreadsheet). University scientists who were consulted for the project included Dr. Jerry Volesky, Dr. Dave Wedin, and Dr. David Loope. Scientists at South Dakota State University were also contacted and included Dr. Alexander Smart and Dr. Eric Mousel. Mr. Gabe Robertson of the Nebraska Department of Roads was contacted on July 17, 2008, and again on April 28, 2009 regarding reclamation procedures the highway department uses in the Sandhills. Suggestions from university scientists and the Nebraska Department of Roads were incorporated into the draft Sandhills Construction/Reclamation Unit, a site specific-reclamation plan that itemizes construction, erosion control, and revegetation procedures in the Sandhills (see attached writeup).

Following consultation with university scientists and the Nebraska Department of Roads, a meeting was held with Michael Kucera, the State Resource Conservationist with the NRCS, in Lincoln, Nebraska, on November 17, 2008. Mr. Kucera was provided with the draft Sandhills Construction/Reclamation Unit for review and discussion. Minor revisions were made to the draft Sandhills Construction/Reclamation Unit to incorporate Mr. Kucera's input. A follow-up meeting with Mr. Kucera was held in June 2010, following release of the DEIS, for additional discussions regarding reclamation in the Sandhills and other parts of Nebraska.

Native perennial grass species will be used to revegetate the Sandhills and other native vegetation types that will be crossed by the project. Native grass species that will be used in the seed mix include those that were recorded during pedestrian surveys of the project, and that have been recommended by the NRCS, university scientists, and the Nebraska Department of Roads. These species have evolved in the central Great Plains and are adapted to the climate extremes that have occurred in the past and may occur again in the future. Should long-term precipitation

patterns in the Sandhills continue to change and vary, vegetation on the project would adapt similarly to vegetation in areas adjacent to the project.

Name	Title/Position	Association	Phone	Relative Experience with Sand Hills	Correspondence
Dr. Jerry Volesky	Associate Professor - Range and Forage Specialist	University of Nebraska Cooperative Extension	308-696-6710	Grazing management and systems research at the Gudmundsen Sandhills Laboratory	left mesg 7/14, he left mesg w me 7/15, spoke over phone on 7/15 12:30pm
Dr. Dave Wedin	Grasslands Ecologist	University of Nebraska - School of Natural Resources	402-472-9608 (o) 402-730-8543 (c)	Principal investigator on the Sand Hills Biocomplexity project	left mesg 7/14, spoke over phone on 7/17 2:30pm
Dr. Geoffrey M. Henebry	Senior Scientist, Professor	South Dakota State University	605-688-5351	Co-investigator on the Sand Hills Biocomplexity project	left mesg 7/15 - spoke over phone on 7/21
Dr. David Loope	Geosciences Professor	University of Nebraska	402-472-2647	Co-investigator on the Sand Hills Biocomplexity project	left mesg 7/15, spoke over phone on 7/17
Dr. Alexander "Sandy" Smart	Assistant Professor, Range Scientist	South Dakota State University	605-688-4017		spoke over phone on 7/15 3pm
Dr. Eric Mousel	Assistant Professor, Range Livestock Production Specialist	South Dakota State University	605-688-5455	Use to work at University of NE, has family that live in the Sand Hills	spoke over the phone on 7/18 2:30pm
Bob Atkenson	Area Engineer	NRCS - Holt County, Nebraska	402-336-3796	Has worked on sand blowout repair	left mesg 7/17 with receptionist, spoke over phone 7/17 at 3pm
Gabe Robertson	Highway Environmental Programs Specialist (Roadside Stabilization)	Nebraska Department of Roads	402-479-4685		spoke over phone on 7/17 10am – asked that I send an email, sent email on 7/17 10am, sent info. over email on 7/18 2pm

CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SH KEYSTONE XL STEELE CITY		
UNIT NAME:	SANDHILLS	
UNIT CODE:	SH	
UNIT DESCRIPTION:	Native prairie on sandy soils dominated primarily by warm- season grasses such as little bluestem, big bluestem, sand bluestem, prairie sandreed, and sideoats grama. Steep slopes are common. Soils are very fine and extremely prone to wind erosion.	
UNIT LOCATION:	The Sandhills occupy approximately 23,000 square miles primarily central Nebraska and limited areas of southern South Dakota. Keystone XL project cross the northeastern corner of the Sandhills primarily in Rock, Holt, Garfield, and Wheeler counties, Nebraska.	
UNIT GOALS:	<ul style="list-style-type: none">• Maintain soil structure and stability to the greatest extent practicable.• Stabilize slopes to prevent erosion.• Restore native grass species.• Maintain wildlife habitat and livestock grazing production.• Complete all work to standards specified in the CMR Plan, contract documents and Details, applicable permits, easement descriptions, and Keystone’s satisfaction.	
SPECIAL CONSIDERATIONS:	<ol style="list-style-type: none">1. Incorporate supplementary construction and reclamation procedures that may be provided by Keystone.2. The ROW has been sited to avoid ridgetops and blowouts to the extent practicable.3. Utilize tracked equipment or low-ground-pressure equipment to the maximum extent practicable on steep slopes or in areas with minimal vegetation cover.4. Minimize grading and side-slope cuts to the maximum extent practicable.5. Stabilize topsoil salvage piles with bio-degradable tackifier.6. Apply straw or native hay mulch for erosion control after clean-up as directed by Keystone.7. Install erosion control matting after regrading as specified by Keystone. Install erosion control matting over native hay mulch as specified by Keystone. In some areas, tackifier may be used in place of matting if approved by Keystone.8. Permanent slope breakers are not anticipated unless specifically directed by Keystone.9. Do not decompact the ROW unless specifically directed by Keystone.10. Seed mix will be applied in two procedures with a drill <u>and</u> broadcast seeder in some locations as described under Seeding Method, Seed Mix and Rate.11. Final cleanup, erosion control, and reseeding must be within 10 miles of mainline backfilling operations or as soon as practicable as determined by Keystone.12. The ROW will not be utilized for access or project traffic following final cleanup within this Con/Rec Unit.13. Fence revegetated ROW from livestock where necessary as directed by Keystone.14. Install windfence to minimize wind at ridge tops and windward facing slopes as directed by Keystone.	
CONSTRUCTION		
ROW WIDTH:	Typically 110 feet. Note that 200 feet of ROW has been identified in many areas within this type to allow for spoil storage in hilly terrain. Do not utilize the additional workspace unless necessary and directed by Keystone.	
CLEARING:	As specified in the CMR Plan. <u>ADDITIONAL REQUIREMENTS:</u> <ol style="list-style-type: none">1. Do not clear more than 110 feet of ROW unless directed by Keystone.2. Leave root crowns and root structures in place to the maximum extent practicable.	
TOPSOIL SALVAGE:	As specified in the CMR Plan to maintain the topsoil resource and reclamation potential. <u>ADDITIONAL REQUIREMENTS:</u> <ol style="list-style-type: none">A. Utilize trench and working salvage (Detail 54) on slopes less than 5% where shown on Alignment Sheets or as directed by Keystone.B. Where grading is necessary, salvage topsoil from entire area to be graded (Detail 53).C. Salvage topsoil horizon at depths as shown on Alignment Sheets or as directed by Keystone.D. Stabilize topsoil salvage piles with bio-degradable tackifier as directed by Keystone.	

CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SH KEYSTONE XL STEELE CITY	
TRENCHING:	As specified in the CMR Plan. <u>ADDITIONAL REQUIREMENTS:</u> A. Anticipate trenchwall instability. B. Insure that topsoil (salvaged or unsalvaged) is not lost to trench caving.
BACKFILL, DECOMPACTION AND REGRADING:	As specified in the CMR Plan to avoid slumping over the trench and match adjacent topography. <u>ADDITIONAL REQUIREMENTS:</u> A. Do not decompact the ROW (subsoil or topsoil) unless specifically directed by Keystone. B. Avoid scalping of undisturbed topsoil on the ROW when backfilling spoil and redistributing stockpiled topsoil. C. Final cleanup, erosion control, and reseeding must be within 10 miles of mainline backfilling operations or as soon as practicable as determined by Keystone.
TEMPORARY EROSION CONTROL:	As specified in the CMR Plan to limit dust, prevent off-site sedimentation or erosion, and accelerated erosion on the ROW. <u>ADDITIONAL REQUIREMENTS:</u> A. Stabilize topsoil salvage piles with biodegradable tackifier as directed by Keystone. B. Install other erosion control to prevent erosion within the ROW, and off-ROW impacts as directed by Keystone. C. Maintain and/or reinstall erosion control features to ensure proper function at all times.
RECLAMATION	
SEEDBED PREPARATION:	As specified in the CMR Plan. <u>ADDITIONAL REQUIREMENTS:</u> A. Additional seedbed preparation may be necessary within this Con/Rec Unit at Keystone direction. B. Cultipack or roll ROW to firm topsoil prior to reseeding as authorized by Keystone. C. Hodder gouger or other imprinter may be used to create microsites for seed germination and lessen the effects of wind erosion as directed by Keystone. D. Composted manure may be used where and as directed by Keystone. Fresh manure is not acceptable.
SEEDING METHOD, SEED MIX AND RATE:	As specified in the CMR Plan. See Detail 70 for a description of seeding procedures and approved equipment. <u>ADDITIONAL REQUIREMENTS:</u> A. Where topography allows drill seeding, seed will be applied in two applications. The first application will be completed with an approved drill seeder using half the seed mix shown below; the second application will be completed with an approved broadcast seeder using the remaining half. Where topography is too steep or loose to operate a drill seeder, the entire seed mix will be applied using an approved broadcast seeder. B. Seed will be provided by Keystone and managed by the Contractor. The Contractor will store seed in a dry, secure location. C. The Contractor will store any unused seed in a dry, secure location and notify Keystone as to the seed's disposition. Keystone may elect to change the storage location. D. The SH seed mix will be applied at locations shown on the Alignment Sheets or as directed by Keystone. E. Use a chain to cover broad-cast seeded areas. Do not use a harrow to cover broadcast-seeded areas in the Sandhills unless directed by Keystone. Use of a harrow may bury seed too deeply. F. <u>Cover crop:</u> To aid in managing wind and water erosion potential, an annual cover crop (perennial ryegrass (var. Linn), a Keystone-approved annual grass/crop, or QuickGuard) may be seeded per Keystone direction.

**CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SH
KEYSTONE XL STEELE CITY**

	Sandhills (SH) Seed Mixture			BROADCAST SEEDING RATE ¹		
				Pounds		
				PLS/		PLS/
				Acre		sq.ft.
	SCIENTIFIC NAME	COMMON NAME	VARIETY ²			
	GRASSES:					
	<i>Agropyron smithii</i>	Western wheatgrass	Barton, Rodan, Rosana	5.00	-	12
	<i>Andropogon hallii</i>	Sand bluestem	Champ, Garden County, Goldstrike	4.00		12
	<i>Bouteloua curtipendula</i>	Sideoats grama	Butte, Pierre, Trailway	3.00	-	14
	<i>Bouteloua gracilis</i>	Blue grama	Bad River	1.00	-	20
	<i>Calamovilfa longifolia</i>	Prairie sandreed	Goshen, Pronghorn	2.00	-	13
	<i>Eragrostis trichodes</i>	Sand lovegrass	Nebraska 27	0.40	-	13
	<i>Elymus canadensis</i>	Canada wildrye	Source identified	5.00	-	13
	<i>Lolium perenne</i> ³	Perennial ryegrass	Linn	3.80	-	20
	<i>Schizachyrium scoparium</i>	Little bluestem	Camper, Pastura	3.00	-	18
	<i>Panicum virgatum</i>	Switchgrass	Blackwell, Pathfinder, Nebraska 28	1.50	-	15
	TOTAL			28.70	-	150
¹ Based on a broadcast seeding rate of approximately 150 Pure Live Seed (PLS) per square foot; total PLS/sq ft does not include perennial ryegrass which is used as a companion crop. Seed rates will be halved where drill seeding is used.						
² These varieties are from Univ. of Nebraska-Lincoln Ext. Circ. 120; other named varieties listed by the USDA-NRCS in Nebraska are acceptable.						
³ Perennial ryegrass may be used as a companion crop where additional erosion control is required or mulching is not possible.						
NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.						
NRCS RECOMMENDED SEEDING DATES:	November 1 to June 30, depending on climatic conditions. These dates may be altered at Keystone direction. Seeding outside these dates may be allowed with Keystone approval.					
MULCHING AND MATTING:	As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 4 for erosion control matting, Detail 47 for weed free native hay or straw mulch. Cornstalks may be used for mulch with Keystone approval. ADDITIONAL REQUIREMENTS: A. All portions of the Project within this Con/Rec Unit will receive a companion crop and either straw mulch, cornstalk mulch, and/or erosion control matting at locations shown on Alignment Sheets or as directed by Keystone. B. Erosion control matting may be applied over native hay or straw mulch as directed by Keystone. C. Biodegradable pins approved by Keystone will be used in place of metal staples to anchor erosion control matting within this Con/Rec Unit. D. Areas where erosion control matting has been installed will be fenced to prevent livestock access as directed by Keystone.					
SLOPE AND TRENCH BREAKERS:	Slope breakers are not anticipated in this Con/Rec Unit unless specifically directed by Keystone since most erosion is caused by wind rather than water. Trench breakers will be installed where directed by Keystone.					
MANAGEMENT PRACTICES						
1. Fence the revegetated ROW from livestock use as directed by Keystone.						
2. Provide for livestock and wildlife access across the trench at locations convenient to livestock and the landowner as practicable per the CMR Plan.						
3. Construction and reclamation practices may be modified from those presented to suit site conditions or permit requirements with Keystone approval.						
4. Monitor revegetation and soil stability post construction. Areas of failed reclamation will be repaired.						
5. Monitor and control noxious weeds as specified in the Nebraska and South Dakota Noxious Weed Management Plans.						

APPENDIX Z

Estimated Criteria Pollutants, Noise, and GHG Emissions

List of Tables

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References

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Table 1 Estimated Direct Criteria Pollutant Emissions from the Rail/Pipeline Scenario – CP Railway Route

Transport and Storage Facilities	Maximum Volume of Crude Transported Per Day, Throughput (bbl/day)	Volume of Crude Stored Per Storage Location (bbl)	Mass of Crude Transported Per Day (tons/day) ^a	Number of Trips Per Day ^{b,c}	Transport Distance, One Way (miles) ^d	Miles Traveled Per Day, One Way ^e	Loaded Cargo ^f		Empty Cargo ^g		Criteria Pollutant Emissions (tons/year) ^h						
							Fuel Efficiency (ton-miles/gal)	Daily Fuel Use (gal/ day)	Fuel Economy (miles/ gal)	Daily Fuel Use (gal/ day)	HC/ VOC	CO	NOx	SO ₂	PM ₁₀	PM _{2.5}	
WCS Extraction Site at Hardisty, Alberta to Rail Loading Terminals at Lloydminster, Saskatchewan (WCS)																	
Pipeline - connecting Hardesty to Lloydminster	730,000	NA	NA	NA	68.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pipeline - connecting storage tanks to 7 terminals at Lloydminster	730,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Storage tanks - (28) 75,000 bbl tanks for all 7 terminals at Lloydminster	730,000	2,100,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	91.4	NA	NA	NA	NA	NA
Rail-Loading Terminals at Lloydminster, Saskatchewan to Storage Facility at Stroud, OK (WCS)																	
Rail - connecting Lloydminster to Stroud	730,000	NA	118,501	12.6	1,903	23,910	480	469,807	0.14	170,788	1,611	6,873	29,532	24.9	537	521	
Pipeline - connecting storage tanks to 7 terminals at Stroud	730,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Storage tanks - (28) 75,000 bbl tanks for all 7 terminals at Stroud	730,000	2,100,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	103	NA	NA	NA	NA	NA
Storage Facilities at Stroud, OK to Storage Facility at Cushing, OK (WCS)																	
Pipeline - connecting Stroud to Cushing	730,000	NA	NA	NA	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pipeline - connecting off-loading terminals to storage tanks	730,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Storage tanks - (11) 75,000 bbl tanks at the Cushing terminal	730,000	825,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	71.8	NA	NA	NA	NA	NA
Bakken Region to Rail Loading Terminal at Epping, ND (Bakken)																	
Truck - road connecting Bakken region to Epping	100,000	NA	14,427	25,677	50.0	1,283,847	154	4,689	7.5	171,180	442	1,887	8,108	6.83	147	143	
Storage tanks - (4) 75,000 bbl tanks at the Epping terminal	100,000	300,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	10.6	NA	NA	NA	NA	NA
Rail Loading Terminals at Epping, North Dakota to Storage Facility at Stroud, Oklahoma (Bakken)																	
Rail - connecting Epping to Stroud	100,000	NA	14,427	1.5	1,347	2,063	480	40,486	0.14	14,734	111	592	2,967	2.14	74.1	71.8	
Storage Facilities at Stroud, Oklahoma to Storage Facility at Cushing, Oklahoma (Bakken)																	
Pipeline - connecting Stroud to Cushing	100,000	NA	NA	NA	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pipeline - connecting off-loading terminals to storage tanks	100,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Storage tanks - (11) 75,000 bbl tanks at the Cushing terminal	100,000	825,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	25.5	NA	NA	NA	NA	NA
										Total	2,466	9,352	40,607	33.9	758	736	

^a Mass of crude transported per day was estimated based on volume of crude transported per day (bbl/day) and density of crude (7.73 lb/gal for dilbit and 6.87 lb/gal for Bakken crude).

^b Number of train trips per day was estimated based on volume of crude transported per day (bbl/day), maximum volume per car (581 bbl/car for dilbit and 653 bbl/car for Bakken crude), and 100 cars per train.

^c Number of truck trips per day was estimated based on volume of crude transported per day (bbl/day) and maximum payload for bulk tanker trucks (27 tons/truck).

^d Transport distances (one way) for the rail routes were taken from the Supplemental EIS Section 5.1.2, Rail/Pipeline Scenario. Transport distance (one way) for the trucks was assumed to be 50 miles.

^e Daily miles traveled estimated based on one-way transport distance and number of trips per day.

^f Fuel efficiency for loaded long-haul locomotives (480 ton-miles/gal) were taken from Bureau of Transportation Statistics (BTS 2011), Table 4-17: Class I Rail Freight Fuel Consumption and Travel, Year 2009. Fuel efficiency for loaded bulk tanker trucks (154 ton-miles/gal or 6.5 gal/1,000 ton-miles) were taken from the National Research Council (NRC 2010). Daily fuel used estimated based on transport distance (one way), fuel efficiency, and mass of crude transported per day.

^g Fuel economy for empty long-haul locomotives (0.14 miles/gal) was taken from BTS 2011, Table 4-17: Class I Rail Freight Fuel Consumption and Travel, Year 2009. Fuel economy for empty bulk tanker trucks or Class 8b trucks (7.5 miles/gal) was taken from NRC 2010. Daily fuel used estimated based on transport distance (one way), fuel economy, and mass of crude transported per day.

^h Criteria pollutant emissions in tons per year was estimated based on emission factors in grams per gallon, daily diesel consumed, and 365 days of operation per year. Emissions of HC/VOCs for storage tanks were calculated using U.S. Environmental Protection Agency (USEPA) TANK 4.0.9d software assuming an external floating roof for each tank with a height of 48 feet. Criteria pollutant emission factors or standards for line-haul locomotives (remanufactured Tier 2) were taken from ICF International (ICF) 2009. The line-haul locomotive emission factors were converted from g/hp-hr to grams per gallon using a conversion factor of 0.048 gal/hp-hr. Emission factors for the bulk tanker trucks or Class 8b trucks were taken from USEPA 2008. Emission factors for the bulk tanker trucks or Class 8b trucks were converted from grams per mile to grams per gallon using a fuel economy factor of 7.5 miles per gallon. SO₂ emission factors for both line haul locomotives and bulk tanker trucks were calculated using a mass balance approach taking into account the molecular weight difference between SO₂ and sulfur and using a 15 ppm sulfur content (ultra-low sulfur diesel), 3,218 grams/gal diesel fuel density, and assuming 100% of fuel sulfur is converted to SO₂.

bbl = barrel, CO = carbon monoxide, CP = Canadian Pacific Railway, dilbit = diluted bitumen, gal = gallon, HC = hydrocarbons, NA = not applicable, NOx = nitrogen oxides, PM_{2.5} = particulate matter <2.5 microns, PM₁₀ = particulate matter<10 micron, SO₂ = sulfur dioxide, VOC = volatile organic compounds, WCS = Western Canadian Select crude

Table 2 Estimated Direct Greenhouse Gas Emissions from the Rail/Pipeline Scenario – CP Rail Route

Transport and Storage Facilities	Maximum	Volume of Crude	Volume of	Mass of Crude	Transport Distance, One Way (miles) ^d	Miles Traveled Per Day, One Way ^e	Loaded Cargo ^f		Empty Cargo ^g		Greenhouse Gas Emissions (tons/year) ^h					Annual Emissions (metric ton/year)
	Volume of Crude Transported Per Day, Throughput (bbl/day)	Crude Stored Per Storage Location (bbl)	Transported Per Day (tons/day) ^a	Number of Trips Per Day ^{b,c}			Fuel Efficiency (ton-miles/gal)	Daily Fuel Use (gal/day)	Fuel Economy (miles/gal)	Daily Fuel Use (gal/day)	CO ₂	CH ₄	N ₂ O	CO ₂ e ⁱ	CO ₂ e ⁱ	
WCS Extraction Site at Hardisty, AB to Rail Loading Terminals at Lloydminster, Saskatchewan (WCS)																
Pipeline - connecting Hardesty to Lloydminster	730,000	NA	NA	NA	68.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pipeline - connecting storage tanks to 7 terminals at Lloydminster	730,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Storage tanks - (28) 75,000 bbl tanks for all 7 terminals at Lloydminster	730,000	2,100,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rail Loading Terminals at Lloydminster, Saskatchewan to Storage Facility at Stroud, OK (WCS)																
Rail - connecting Lloydminster to Stroud	730,000	NA	118,501	12.6	1,903	23,910	480	469,807	0.14	170,788	2,386,449	96.8	19.4	2,394,484		2,172,242
Pipeline - connecting storage tanks to 7 terminals at Stroud	730,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Storage tanks - (28) 75,000 bbl tanks for all 7 terminals at Stroud	730,000	2,100,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Storage Facilities at Stroud, OK to Storage Facility at Cushing, OK (WCS)																
Pipeline - connecting Stroud to Cushing	730,000	NA	NA	NA	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pipeline - connecting off-loading terminals to storage tanks	730,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Storage tanks - (11) 75,000 bbl tanks at the Cushing terminal	730,000	825,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bakken Region to Rail Loading Terminal at Epping, ND (Bakken)																
Truck - road connecting Bakken region to Epping	100,000	NA	14,427	25,677	50.0	1,283,847	154	4,689	7.5	171,180	655,174	26.6	5.32	657,380		596,366
Storage tanks - (4) 75,000 bbl tanks at the Epping terminal	100,000	300,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rail Loading Terminals at Epping, ND, to Storage Facility at Stroud, OK (Bakken)																
Rail - connecting Epping to Stroud	100,000	NA	14,427	1.5	1,347	2,063	480	40,486	0.14	14,734	205,715	8.3	1.7	296,407		187,250
Storage Facilities at Stroud, OK to Storage Facility at Cushing, OK (Bakken)																
Pipeline - connecting Stroud to Cushing	100,000	NA	NA	NA	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pipeline - connecting off-loading terminals to storage tanks	100,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Storage tanks - (11) 75,000 bbl tanks at the Cushing terminal	100,000	825,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
										Total	3,247,338	132	26.3	3,258,271		2,955,857

^a Mass of crude transported per day was estimated based on volume of crude transported per day (bbl/day) and density of crude (7.73 lb/gal for dilbit and 6.87 lb/gal for Bakken crude).

^b Number of train trips per day was estimated based on volume of crude transported per day (bbl/day), maximum volume per car (581 bbl/car for dilbit and 653 bbl/car for Bakken crude), and 100 cars per train.

^c Number of truck trips per day was estimated based on volume of crude transported per day (bbl/day) and maximum payload for bulk tanker trucks (27 tons/truck).

^d Transport distances (one way) for the rail routes were taken from the Supplemental EIS Section 5.1.2, Rail/Pipeline Scenario. Transport distance (one way) for the trucks was assumed to be 50 miles.

^e Daily miles traveled estimated based on one way transport distance and number of trips per day.

^f Fuel efficiency for loaded long-haul locomotives (480 ton-miles/gal) were taken from Bureau of Transportation Statistics (BTS 2011), Table 4-17: Class I Rail Freight Fuel Consumption and Travel, Year 2009. Fuel efficiency for loaded bulk tanker trucks (154 ton-miles/gal or 6.5 gal/1,000 ton-miles) were taken from National Research Council, 2010 (NRC 2010). Daily fuel used estimated based on transport distance (one way), fuel efficiency, and mass of crude transported per day.

^g Fuel economy for empty long-haul locomotives (0.14 miles/gal) was taken from BTS 2011, Table 4-17: Class I Rail Freight Fuel Consumption and Travel, Year 2009. Fuel economy for empty bulk tanker trucks (7.5 miles/gal) was taken from NRC 2010. Daily fuel used estimated based on transport distance (one way), fuel economy, and mass of crude transported per day.

^h Greenhouse gas emissions in tons per year was estimated based on emission factors in kilograms per million British Thermal Units (kg/MMBtu), daily diesel consumed (gal/day), and high heating value of diesel (0.138 MMBtu/gal). Greenhouse gas emission factors in kg/MMBtu were taken from 40 CFR 98 Subpart C, Table C-1 and C-2.

^j Total greenhouse gases were estimated as CO₂ equivalents (CO₂e), accounting for global warming potentials of CO₂ (1), CH₄ (21) and N₂O (310).

bbl = barrel, CFR = Code of Federal Regulations, CH₄ = methane, CO₂ = carbon dioxide, CO₂e = CO₂ equivalents, CP = Canadian Pacific Railway, dilbit = diluted bitumen, gal = gallon, kg = kilogram, MMBtu = million British thermal units, N₂O = nitrous oxide, NA = not applicable, WCS = Western Canadian Select crude

Table 3 Predicted Noise Levels at Closest Noise Sensitive Areas from the Rail and Pipeline Scenario – CP Rail Route

State	County	Pop. Density (people /mi ²) ^a	Closest NSA Dist. to Railway (ft) ^b	Existing Ldn Noise Level (dBA) ^c	Volume of WCS Crude Transported Per Day (bbl /day)	Daily train volume (trains /day) ^d	Day time (7am-10pm) hourly train volume (trains /hr) ^e	Night time (10pm- 7am) train volume (trains /hr) ^f	Total Daytime Leq for Locomotives and Rail Cars (dBA) ^g	Total Night time Leq for Loco- motives and Rail Cars (dBA) ^g	CP Rail Scenario Ldn at 50 feet (dBA) ^g	CP Rail Scenario Ldn at Closest NSA Plus Existing Ldn (dBA) ^h
North Dakota												
	Burke	1.8	162	60.4	730,000	12.6	7.9	4.7	75.9	73.7	80.5	70.7
	Ward	30.6	55	69.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	80.1
	Renville	2.8	540	49.9	730,000	12.6	7.9	4.7	75.9	73.7	80.5	60.3
	McHenry	2.9	145	61.3	730,000	12.6	7.9	4.7	75.9	73.7	80.5	71.7
	Pierce	4.3	175	59.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	70.0
	Wells	3.3	194	58.8	730,000	12.6	7.9	4.7	75.9	73.7	80.5	69.2
	Eddy	3.8	190	59.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	69.3
	Foster	5.3	166	60.1	730,000	12.6	7.9	4.7	75.9	73.7	80.5	70.5
	Griggs	3.4	226	57.5	730,000	12.6	7.9	4.7	75.9	73.7	80.5	67.8
	Steele	2.8	266	56.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	66.4
	Barnes	7.4	552	49.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	60.1
	Cass	84.9	39	72.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	83.1
	Richland	11.4	60	69.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	79.3
Minnesota												
	Clay	56.4	44	71.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	82.0
	Wilkin	8.8	79	66.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	77.0
	Traverse	6.2	313	54.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	65.0
	Grant	11	202	58.4	730,000	12.6	7.9	4.7	75.9	73.7	80.5	68.8
	Stevens	17.3	130	62.3	730,000	12.6	7.9	4.7	75.9	73.7	80.5	72.6
	Pope	16.4	447	51.5	730,000	12.6	7.9	4.7	75.9	73.7	80.5	61.9
	Swift	13.2	113	63.5	730,000	12.6	7.9	4.7	75.9	73.7	80.5	73.8
	Kandiyohi	53	68	67.9	730,000	12.6	7.9	4.7	75.9	73.7	80.5	78.3
	Chippewa	21.4	173	59.8	730,000	12.6	7.9	4.7	75.9	73.7	80.5	70.1
	Yellow											
	Medicine	13.8	52	70.2	730,000	12.6	7.9	4.7	75.9	73.7	80.5	80.6
	Lyon	36.2	119	63.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	73.4
	Lincoln	11	443	51.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	62.0
	Pipestone	20.6	132	62.1	730,000	12.6	7.9	4.7	75.9	73.7	80.5	72.5
	Rock	20.1	175	59.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	70.0
South Dakota												
	Minnehaha	210	151	61.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	71.3
Iowa												
	Lyon	19.7	110	63.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	74.1
	Sioux	43.9	83	66.2	730,000	12.6	7.9	4.7	75.9	73.7	80.5	76.5
	Plymouth	29	56	69.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	79.9
	Woodbury	117.1	106	64.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	74.4
	Mills	34.4	125	62.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	73.0
	Fremont	14.6	102	64.4	730,000	12.6	7.9	4.7	75.9	73.7	80.5	74.7
Nebraska												
	Dakota	79.5	51	70.4	730,000	12.6	7.9	4.7	75.9	73.7	80.5	80.8
	Thurston	17.6	143	61.4	730,000	12.6	7.9	4.7	75.9	73.7	80.5	71.8
	Burt	14	97	64.8	730,000	12.6	7.9	4.7	75.9	73.7	80.5	75.2
	Dodge	69.4	63	68.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	78.9
	Saunders	27.7	70	67.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	78.0
	Cass	45.3	101	64.5	730,000	12.6	7.9	4.7	75.9	73.7	80.5	74.8

State	County	Pop. Density (people /mi²) ^a	Closest NSA Dist. to Railway (ft) ^b	Existing Ldn Noise Level (dBA) ^c	Volume of WCS Crude Transported Per Day (bbl /day)	Daily train volume (trains /day) ^d	Day time (7am-10pm) hourly train volume (trains /hr) ^e	Night time (10pm- 7am) train volume (trains /hr) ^f	Total Daytime Leq for Locomotives and Rail Cars (dBA) ^g	Total Night time Leq for Loco- motives and Rail Cars (dBA) ^g	CP Rail Scenario Ldn at 50 feet (dBA) ^g	CP Rail Scenario Ldn at Closest NSA Plus Existing Ldn (dBA) ^h
Missouri												
	Atchison	10.4	73	67.3	730,000	12.6	7.9	4.7	75.9	73.7	80.5	77.6
	Holt	10.6	86	65.9	730,000	12.6	7.9	4.7	75.9	73.7	80.5	76.2
	Andrew	40	151	61.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	71.3
	Buchanan	218.6	67	68.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	78.4
	Platte	212.6	50	70.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	80.9
	Clay	558.6	798	46.5	730,000	12.6	7.9	4.7	75.9	73.7	80.5	56.9
	Jackson	1115.3	1600	40.5	730,000	12.6	7.9	4.7	75.9	73.7	80.5	50.8
Kansas												
	Wyandotte	1039	60	69.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	79.3
	Johnson	1149.6	45	71.5	730,000	12.6	7.9	4.7	75.9	73.7	80.5	81.8
	Miami	57	75	67.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	77.4
	Linn	16.3	53	70.1	730,000	12.6	7.9	4.7	75.9	73.7	80.5	80.4
	Bourbon	23.9	110	63.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	74.1
	Crawford	66.4	86	65.9	730,000	12.6	7.9	4.7	75.9	73.7	80.5	76.2
	Cherokee	36.8	111	63.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	74.0
Oklahoma												
	Ottawa	67.6	52	70.2	730,000	12.6	7.9	4.7	75.9	73.7	80.5	80.6
	Craig	19.7	119	63.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	73.4
	Rogers	128.6	110	63.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	74.1
	Tulsa	1058.1	87	65.8	730,000	12.6	7.9	4.7	75.9	73.7	80.5	76.1
	Creek	73.6	57	69.4	730,000	12.6	7.9	4.7	75.9	73.7	80.5	79.8
	Lincoln	36	242	56.9	730,000	12.6	7.9	4.7	75.9	73.7	80.5	67.2

^a Population density taken from U.S. Census Bureau data for 2010 (U.S. Census Bureau 2010)

^b Closest NSA distance to railway was obtained from aerial photography/maps.

^c Existing noise levels were estimated based on the proximity of the NSA to existing railway noise; estimation methodology described in U.S. Department of Transportation (USDOT) 2006.

^d Daily train volume estimated from volume of WCS crude transported per day, maximum volume of WCS crude per car (581 bbl/car), and 100 cars per train unit.

^e Daytime hourly train volume estimated based on daytime period being from 7am-10pm (i.e., 15 hours per day)

^f Nighttime hourly train volume estimated based on nighttime period being from 10pm-7am (i.e., 9 hours per day)

^g Total daytime and nighttime Leq for locomotives and rail cars, and the Canadian Pacific Rail Scenario Ldn at 50 feet were calculated using the methodology described in USDOT 2006 for a commuter rail system. The noise calculations assume 4 diesel powered locomotives per train unit with a speed of 40 miles per hour, and 100 cars per train unit.

^h Canadian Pacific Rail Scenario plus existing Ldn levels were calculated using the typical logarithmic equation for combining noise levels: 10Log(10^(Existing Noise/10) + 10^(Canadian Pacific Scenario Noise/10))

bbl = barrel, CP = Canadian Pacific Railway, dBA = decibels on the A-weighted scale, ft = feet, hr = hour, Leq = equivalent continuous sound level, Ldn = day-night sound level, mi = miles, NSA = Noise Sensitive Area, WCS = Western Canadian Select

Table 4 Predicted Noise Levels at Closest Noise Sensitive Areas from the Rail and Pipeline Scenario – CN Rail Route

State	County	Pop. density (people /mi²) ^a	Closest NSA Distance to Railway (ft) ^b	Existing Ldn Noise Level (dBA) ^c	Volume of WCS Crude Trans-ported Per Day (bbl/ day)	Daily train volume (trains/ day) ^d	Day time (7am-10pm) hourly train volume (trains/ hr) ^e	Night time (10pm- 7am) train volume (trains/ hr) ^f	Total Day time Leq for Loco-motives and Rail Cars (dBA) ^g	Total Night time Leq for Loco- motives and Rail Cars (dBA) ^g	CN Rail Scenario Ldn at 50 feet (dBA) ^g	CN Rail Scenario Ldn at Closest NSA Plus Existing Ldn (dBA) ^h
Minnesota												
	Roseau	9.3	69	67.8	730,000	12.6	7.9	4.7	75.9	73.7	80.5	78.1
	Lake of the Woods	3.1	216	57.9	730,000	12.6	7.9	4.7	75.9	73.7	80.5	68.2
	Koochiching	4.3	92	65.3	730,000	12.6	7.9	4.7	75.9	73.7	80.5	75.6
	St Louis	32	132	62.1	730,000	12.6	7.9	4.7	75.9	73.7	80.5	72.5
	Carlton	41.1	195	58.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	69.1
	Pine	21.1	137	61.8	730,000	12.6	7.9	4.7	75.9	73.7	80.5	72.2
	Kanabec	31.1	278	55.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	66.0
	Isanti	86.8	86	65.9	730,000	12.6	7.9	4.7	75.9	73.7	80.5	76.2
	Anoka	782.1	120	63.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	73.3
	Hennepin	2081.7	65	68.3	730,000	12.6	7.9	4.7	75.9	73.7	80.5	78.6
	Ramsey	3341.7	77	66.8	730,000	12.6	7.9	4.7	75.9	73.7	80.5	77.2
	Dakota	709	88	65.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	76.0
	Rice	129.4	151	61.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	71.3
	Steele	85.1	143	61.4	730,000	12.6	7.9	4.7	75.9	73.7	80.5	71.8
	Freeborn	44.2	65	68.3	730,000	12.6	7.9	4.7	75.9	73.7	80.5	78.6
Wisconsin												
	Douglas	33.9	141	61.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	71.9
Iowa												
	Worth	19	107	64.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	74.3
	Cerro Gordo	77.7	58	69.3	730,000	12.6	7.9	4.7	75.9	73.7	80.5	79.6
	Franklin	18.4	91	65.4	730,000	12.6	7.9	4.7	75.9	73.7	80.5	75.7
	Hardin	30.8	95	65.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	75.4
	Story	156.3	116	63.3	730,000	12.6	7.9	4.7	75.9	73.7	80.5	73.6
	Polk	750.5	117	63.2	730,000	12.6	7.9	4.7	75.9	73.7	80.5	73.5
	Warren	81.1	73	67.3	730,000	12.6	7.9	4.7	75.9	73.7	80.5	77.6
	Marion	60.1	47	71.1	730,000	12.6	7.9	4.7	75.9	73.7	80.5	81.5
	Lucas	20.7	87	65.8	730,000	12.6	7.9	4.7	75.9	73.7	80.5	76.1
	Wayne	12.2	67	68.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	78.4
Missouri												
	Mercer	8.3	110	63.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	74.1
	Grundy	23.6	184	59.2	730,000	12.6	7.9	4.7	75.9	73.7	80.5	69.6
	Livingston	28.5	1600	40.5	730,000	12.6	7.9	4.7	75.9	73.7	80.5	50.8
	Daviess	15	1371	41.8	730,000	12.6	7.9	4.7	75.9	73.7	80.5	52.2
	Caldwell	22.1	103	64.3	730,000	12.6	7.9	4.7	75.9	73.7	80.5	74.6
	Ray	41.3	99	64.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	75.0
	Clay	558.6	128	62.4	730,000	12.6	7.9	4.7	75.9	73.7	80.5	72.8
	Jackson	1115.3	123	62.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	73.1
Kansas												
	Johnson	1149.6	83	66.2	730,000	12.6	7.9	4.7	75.9	73.7	80.5	76.5
	Miami	57	156	60.7	730,000	12.6	7.9	4.7	75.9	73.7	80.5	71.0
	Linn	16.3	234	57.2	730,000	12.6	7.9	4.7	75.9	73.7	80.5	67.5
	Anderson	14	284	55.5	730,000	12.6	7.9	4.7	75.9	73.7	80.5	65.8
	Allen	26.7	96	64.9	730,000	12.6	7.9	4.7	75.9	73.7	80.5	75.3
	Neosho	28.9	75	67.0	730,000	12.6	7.9	4.7	75.9	73.7	80.5	77.4
	Labette	33.5	129	62.3	730,000	12.6	7.9	4.7	75.9	73.7	80.5	72.7
Oklahoma												
	Craig	19.7	113	63.5	730,000	12.6	7.9	4.7	75.9	73.7	80.5	73.8
	Mayes	63	108	63.9	730,000	12.6	7.9	4.7	75.9	73.7	80.5	74.2

State	County	Pop. density (people /mi ²) ^a	Closest NSA Distance to Railway (ft) ^b	Existing Ldn Noise Level (dBA) ^c	Volume of WCS Crude Trans-ported Per Day (bbl/ day)	Daily train volume (trains/ day) ^d	Day time (7am-10pm) hourly train volume (trains/ hr) ^e	Night time (10pm- 7am) train volume (trains/ hr) ^f	Total Day time Leq for Loco-motives and Rail Cars (dBA) ^g	Total Night time Leq for Loco- motives and Rail Cars (dBA) ^g	CN Rail Scenario Ldn at 50 feet (dBA) ^g	CN Rail Scenario Ldn at Closest NSA Plus Existing Ldn (dBA) ^h
	Wagoner	130.1	63	68.6	730,000	12.6	7.9	4.7	75.9	73.7	80.5	78.9
	Tulsa	1058.1	87	65.8	730,000	12.6	7.9	4.7	75.9	73.7	80.5	76.1
	Creek	73.6	57	69.4	730,000	12.6	7.9	4.7	75.9	73.7	80.5	79.8
	Lincoln	36	242	56.9	730,000	12.6	7.9	4.7	75.9	73.7	80.5	67.2

^a Population density was taken from U.S. Census Bureau data for 2010 (U.S. Census Bureau 2010).

^b Closest NSA distance to railway was obtained from aerial photography/maps.

^c Existing noise levels were estimated based on the proximity of the NSA to existing railway noise; estimation methodology described in USDOT 2006.

^d Daily train volume estimated from volume of WCS crude transported per day, maximum volume of WCS crude per car (581 bbl/car), and 100 cars per train unit.

^e Daytime hourly train volume estimated based on daytime period being from 7am-10pm (i.e., 15 hours per day).

^f Nighttime hourly train volume estimated based on nighttime period being from 10pm-7am (i.e., 9 hours per day).

^g Total daytime and nighttime Leq for locomotives and rail cars, and the Canadian National Rail Scenario Ldn at 50 feet were calculated using the methodology described in USDOT 2006 for a commuter rail system. The noise calculations assume 4 diesel powered locomotives per train unit with a speed of 40 miles per hour, and 100 cars per train unit.

^h Canadian National Rail Scenario plus existing Ldn levels were calculated using the typical logarithmic equation for combining noise levels: 10Log(10^(Existing Noise/10) + 10^(Canadian National Scenario Noise/10)).

bbl = barrel, CN = Canadian National Railway, dBA = decibels on the A-weighted scale, ft = feet, hr = hour, Ldn = day-night sound level, Leq = equivalent continuous sound level, mi = miles, NSA = Noise Sensitive Area, WCS = Western Canadian Select crude

Table 5 Estimated Direct Criteria Pollutant Emissions from the Rail/Tanker Scenario – Non-Tanker Portion

Transport and Storage Facilities	Maximum Volume of Crude Transported Per Day, Throughput (bbl/day)	Volume of Crude Stored Per Storage Location (million bbl)	Mass of Crude Transported Per Day (tons/day) ^a	Number of Trips Per Day ^{b,c}	Transport Distance, One Way (miles) ^d	Miles Traveled Per Day, One Way ^e	Loaded Cargo ^f		Empty Cargo ^g		Criteria Pollutant Emissions (ton/year) ^h						
							Fuel Efficiency (ton-miles/gal)	Daily Fuel Use (gal/day)	Fuel Economy (miles/ gal)	Daily Fuel Use (gal/day)	HC/ VOC	CO	NOx	SO ₂	PM ₁₀	PM _{2.5}	
WCS Extraction Site at Hardisty, Alberta to Rail Loading Terminals at Lloydminster, Saskatchewan (WCS)																	
Pipeline - connecting Hardesty to Lloydminster	730,000	NA	NA	NA	68	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Pipeline - connecting storage tanks to 7 terminals at Lloydminster	730,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Storage tanks - (28) 75,000 bbl tanks for all 7 terminals at Lloydminster	730,000	2.10	NA	NA	NA	NA	NA	NA	NA	NA	91.4	NA	NA	NA	NA	NA	
Rail Loading Terminals at Lloydminster, Saskatchewan to New Marine Terminal at Prince Rupert, British Columbia (WCS)																	
Rail - connecting Lloydminster to Prince Rupert	730,000	NA	118,501	12.6	1,069	13,430	480	263,887	0.14	95,930	905	3,860	16,588	14.0	302	293	
Storage tanks - (28) 75,000 bbl tanks for 7 rail terminals at Prince Rupert	730,000	2.10	NA	NA	NA	NA	NA	NA	NA	NA	91.4	NA	NA	NA	NA	NA	
Pipeline - connecting storage tanks to 7 terminals at Prince Rupert	730,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Storage tanks - (14) 496,000 bbl tanks for the marine terminal at Prince Rupert	730,000	6.94	NA	NA	NA	NA	NA	NA	NA	NA	36.9	NA	NA	NA	NA	NA	
Bakken Region to Rail Loading Terminal at Epping, North Dakota (Bakken)																	
Truck - road connecting Bakken region to Epping	100,000	NA	14,427	25,677	50	1,283,847	154	4,689	7.5	171,180	289	1,650	5,832	6.83	137	126	
Storage tanks - (4) 75,000 bbl tanks at the Epping terminal	100,000	0.30	NA	NA	NA	NA	NA	NA	NA	NA	10.6	NA	NA	NA	NA	NA	
Rail Loading Terminals at Epping, North Dakota to Storage Facility at Stroud, Oklahoma (Bakken)																	
Rail - connecting Epping to Stroud	100,000	NA	14,427	1.5	1,347	2,063	480	40,486	0.14	14,734	111	592	2,967	2.14	74.1	71.8	
Storage Facilities at Stroud, Oklahoma to Storage Facility at Cushing, Oklahoma (Bakken)																	
Pipeline (existing) - connecting Stroud to Cushing	100,000	NA	NA	NA	17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Pipeline – connecting off-loading terminals to storage tanks	100,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Storage tanks - (11) 75,000 bbl tanks at the Cushing terminal	100,000	0.83	NA	NA	NA	NA	NA	NA	NA	NA	25.5	NA	NA	NA	NA	NA	
											Total	1,561	6,103	25,387	23.0	513	491

^a Mass of crude transported per day was estimated based on volume of crude transported per day (bbl/day) and density of crude (7.73 lb/gal for dilbit and 6.87 lb/gal for Bakken crude).

^b Number of train trips per day was estimated based on volume of crude transported per day (bbl/day), maximum volume per car (581 bbl/car for dilbit and 653 bbl/car for Bakken crude), and 100 cars per train.

^c Number of truck trips per day was estimated based on volume of crude transported per day (bbl/day) and maximum payload for bulk tanker trucks (27 tons/truck).

^d Transport distances (one way) for the rail routes were taken from the Supplemental EIS Section 5.1.2, Rail/Pipeline Scenario, with the exception of the connection from Lloydminster to Prince Rupert, which is from ICF 2012, Exhibit 9, p. 16. Transport distance (one way) for the trucks was assumed to be 50 miles.

^e Daily miles traveled estimated based on one way transport distance and number of trips per day.

^f Fuel efficiency for loaded long-haul locomotives (480 ton-miles/gal) were taken from Bureau of Transportation Statistics (BTS 2011), Table 4-17: Class I Rail Freight Fuel Consumption and Travel, Year 2009. Fuel efficiency for loaded bulk tanker trucks (154 ton-miles/gal or 6.5 gal/1,000 ton-miles) were taken from National Research Council (NRC 2010). Daily fuel used estimated based on transport distance (one way), fuel efficiency, and mass of crude transported per day.

^g Fuel economy for empty long-haul locomotives (0.14 miles/gal) were taken from BTS 2011, Table 4-17: Class I Rail Freight Fuel Consumption and Travel, Year 2009. Fuel economy for empty bulk tanker trucks (7.5 miles/gal) were taken from NRC 2010. Daily fuel used estimated based on transport distance (one way), fuel economy, and mass of crude transported per day.

^h Criteria pollutant emissions in tons per year was estimated based on emission factors in grams per gallon, daily diesel consumed, and 365 days of operation per year. Emissions of HC/VOCs for storage tanks was calculated using USEPA TANK 4.0.9d software assuming an external floating roof for each tank with a height of 48 feet. Criteria pollutant emission factors or standards for line-haul locomotives (remanufactured Tier 2) were taken from Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, Chapter 5- Rail and Heavy-duty Trucks, April 2009 (ICF 2009). The line-haul locomotive emission factors were converted from g/hp-hr to grams per gallon using a conversion factor of 0.048 gal/hp-hr. Emission factors for the bulk tanker trucks or Class 8b trucks were taken from USEPA’s Average In-Use Emissions from Heavy-Duty Trucks, October 2008 (USEPA 2008). Emission factors for the bulk tanker trucks or Class 8b trucks were converted from grams per mile to grams per gallon using a fuel economy factor of 7.5 miles per gallon. SO₂ emission factors for both line haul locomotives and bulk tanker trucks were calculated using a mass balance approach taking into account the molecular weight difference between SO₂ and sulfur and using a 15 ppm sulfur content (ultra-low sulfur diesel), 3.218 grams/gal diesel fuel density, and assuming 100% of fuel sulfur is converted to SO₂.

bbl = barrel, CO = carbon monoxide, dilbit = diluted bitumen, g = grams, gal = gallon, HC = hydrocarbon, hp-hr = horsepower-hour, lb = pound, NA = not applicable, NOx = nitrogen oxides, PM_{2.5} = particulate matter <2.5 microns, PM₁₀ = particulate matter<10 micron, ppm = parts per million, SO₂ = sulfur dioxide, VOC = volatile organic compound, WCS = Western Canadian Select crude

Table 6 Estimated Direct Criteria Pollutant Emissions from the Rail/Tanker Scenario – Tanker Portion

Transport and Storage Facilities	Maximum Volume of Crude Transported Per Day, Throughput (bbl/day)	Number of Trips Per Day ^a	Transport Distance, One Way (miles) ^b	Fuel Type ^c	Propulsion Engine ^{d,e}		Auxiliary Engines ^d		Speed (miles/hr) ^f	Activity (hours/trip) ^g	Criteria Pollutant Emissions (tons/year) ^h					
					Total Max. Power Rating (kW)	Engine Load Factor	Total Max. Power Rating (kW)	Engine Load Factor			HC/VOC	CO	NOx	SO ₂	PM ₁₀	PM _{2.5}
New Marine Terminal at Prince Rupert, British Columbia to Texas Gulf Coast – Return Trip (Houston/Port Arthur) (WCS)																
Tankers ¹ (loaded) - RSZ leaving Prince Rupert	730,000	0.83	110	MDO	9,400	0.23	1,985	0.28	10.4	10.7	4.66	10.7	130	39.1	4.61	4.22
Tankers (loaded) – ECA cruise zone connecting Prince Rupert to Houston/Port Arthur	730,000	0.83	309	MDO	9,400	0.83	1,985	0.24	15.5	19.9	27.1	60.2	725	218	25.8	23.6
Tankers (loaded) - non-ECA cruise zone connecting Prince Rupert to Houston/Port Arthur	730,000	0.83	6,354	IFO 380	9,400	0.83	1,985	0.24	15.5	409	556	1,238	15,805	12,700	1,610	1,486
Tankers (loaded) - RSZ entering Houston/Port Arthur	730,000	0.83	40.6	MDO	9,400	0.23	1,985	0.28	10.4	3.92	1.72	3.94	47.7	14.4	1.70	1.55
Tankers - hoteling at Houston/Port Arthur	730,000	0.83	0	MDO	9,400	0	1,985	0.26	0	48.0	3.29	9.05	114	34.9	4.03	3.70
Tankers (ballast) - RSZ leaving Houston/Port Arthur	730,000	0.83	40.6	MDO	9,400	0.23	1,985	0.28	10.4	3.92	1.72	3.94	47.7	14.4	1.70	1.55
Tankers (ballast) - ECA cruise zone connecting Houston/Port Arthur to Prince Rupert	730,000	0.83	309	MDO	9,400	0.83	1,985	0.24	16.1	19.2	26.1	58.1	699	210	24.9	22.8
Tankers (ballast) - non-ECA cruise zone connecting Houston/Port Arthur to Prince Rupert	730,000	0.83	6,354	IFO 380	9,400	0.83	1,985	0.24	16.1	395	536	1,194	15,240	12,247	1,553	1,433
Tankers (ballast) - RSZ entering Prince Rupert	730,000	0.83	110	MDO	9,400	0.23	1,985	0.28	10.4	10.7	4.66	10.7	130	39.1	4.61	4.22
Tankers - hoteling at Prince Rupert	730,000	0.83	0	MDO	9,400	0	1,985	0.26	0	48.0	3.29	9.05	114	34.9	4.03	3.70
										Total	1,165	2,598	33,052	25,553	3,235	2,984

a Number of tanker trips per day based on volume of crude transported per day (bbl/day) and maximum volume per Suezmax vessel light-loaded to traverse Panama Canal (884,000 bbl/tanker for crude oil) from the Supplemental EIS Section 5.1.2, Rail/Pipeline Scenario.

b Transport distances (one way) for the tankers were derived from Poten & Partners 2012 using 1/2 the average round-trip distance from Prince Rupert to the Houston and Port Arthur marine terminals via the Panama Canal. North American Emission Control Areas (ECAs) are assumed to include reduced speed zones (RSZs) surrounding each port. RSZ information for Houston/Port Arthur from ICF 2009, Table 2-18: Matched Ports and Regions; Prince Rupert Harbor RSZ estimated using average of all North Pacific port RSZs.

c Fuel types from Poten & Partners 2012, pg. 6. ECA areas mandate the use of low-sulfur marine fuel (marine diesel oil, MDO) using auxiliary engines. During cruising in non-ECA areas, tankers use main propulsion engines and intermediate fuel oil (IFO 380).

d Engine power ratings and load factors from ICF 2009, Table 2-4 and Table 2-7.

e Propulsion engine RSZ load factors calculated using the following equation from ICF 2009, pg. 2-11: Load Factor = (actual speed/maximum speed)^3. Maximum speed calculated using the assumption from ICF 2009 that cruise speed is an average of 94% maximum speed.

f Tanker speeds from Poten & Partners 2012, Appendix A. Knots (nautical miles per hour) converted to miles/hour by multiplying by a factor of 1.15 miles/nautical mile.

g Activity (duration) calculated using tanker speed and distance traveled per trip. Hoteling data are from Poten & Partners 2012, Appendix A.

h Criteria pollutant emissions in tons per year were calculated using the following equation from ICF 2009, pg. 2-1: Emissions = Power Rating x Load Factor x Activity Hours x Emission Factor. Emission factors for propulsion engine were taken from ICF 2009, Table 2-9, and for auxiliary engine from ICF 2009, Table 2-16. Residual oil (RO) emission factors were used for IFO 380.

i Tankers are Suezmax vessels with a carrying capacity of 884,000 bbl for travel through the Panama Canal.

bbl = barrel, CO = carbon monoxide, ECAs = North American emission control areas, HC = hydrocarbon, hr = hour, kW = kilowatt, MDO = marine diesel oil, NOx = nitrogen oxides, PM_{2.5} = particulate matter <2.5 microns, PM₁₀ = particulate matter<10 micron, RSZs = reduced speed zones, SO₂ = sulfur dioxide, VOC = volatile organic compound, WCS = Western Canadian Select crude

Table 7 Estimated Direct Greenhouse Gas Emissions from the Rail/Tanker Scenario – Non-Tanker Portion

Transport and Storage Facilities	Maximum Volume of Crude Transported Per Day, Throughput (bbl/day)	Volume of Crude Stored Per Location (million bbl)	Mass of Crude Transported Per Day (tons/day) ^a	Number of Trips Per Day ^{b,c}	Transport Distance, One Way (miles) ^d	Miles Traveled Per Day, One Way ^e	Greenhouse Gas Emissions ^h										
							Loaded Cargo ^f		Empty Cargo ^g		(tons/year)					(metric tons/ year)	
							Fuel Efficiency (ton-miles/gal)	Fuel Use (gal/ day)	Fuel Economy (miles/ gal)	Fuel Use (gal/ day)	CO ₂	CH ₄	N ₂ O	CO ₂ e	CO ₂ e		
WCS Extraction Site at Hardisty, Alberta to Rail Loading Terminals at Lloydminster, Saskatchewan (WCS)																	
Pipeline – connecting Hardesty to Lloydminster	730,000	NA	NA	NA	68	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Pipeline – connecting storage tanks to 7 terminals at Lloydminster	730,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Storage tanks - (28) 75,000 bbl tanks at Lloydminster	730,000	2.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Rail Loading Terminals at Lloydminster, Saskatchewan to New Marine Terminal at Prince Rupert, British Columbia (WCS)																	
Rail – connecting Lloydminster to Prince Rupert	730,000	NA	118,501	12.6	1,069	13,430	480	263,887	0.14	95,930	1,340,450	54.4	10.9	1,344,963	1,220,131		
Pipeline – connecting storage tanks to 7 terminals at Prince Rupert	730,000	NA	NA	NA	105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Storage tanks - (14) 496,000 bbl tanks at Prince Rupert	730,000	6.94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Bakken Region to Rail Loading Terminal at Epping, North Dakota (Bakken)																	
Truck – road connecting Bakken region to Epping	100,000	NA	14,427	25,677	50	1,283,847	154	4,689	7.5	171,180	655,174	26.6	5.32	657,380	596,366		
Storage tanks - (4) 75,000 bbl tanks at the Epping terminal	100,000	0.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Rail Loading Terminals at Epping, North Dakota to Storage Facility at Stroud, Oklahoma (Bakken)																	
Rail – connecting Epping to Stroud	100,000	NA	14,427	1.5	1,347	2,063	480	40,486	0.14	14,734	205,715	8.34	1.67	206,407	187,250		
Storage Facilities at Stroud, Oklahoma to Storage Facility at Cushing, Oklahoma (Bakken)																	
Pipeline (existing) –connecting Stroud to Cushing	100,000	NA	NA	NA	17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Storage tanks - (11) 75,000 bbl tanks at the Cushing terminal	100,000	0.83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
											Total	2,201,338	89.3	17.9	2,208,749	2,003,746	

^a Mass of crude transported per day was estimated based on volume of crude transported per day (bbl/day) and density of crude (7.73 lb/gal for dilbit and 6.87 lb/gal for Bakken crude).

^b Number of train trips per day was estimated based on volume of crude transported per day (bbl/day), maximum volume per car (581 bbl/car for dilbit and 653 bbl/car for Bakken crude), and 100 cars per train.

^c Number of truck trips per day was estimated based on volume of crude transported per day (bbl/day) and maximum payload for bulk tanker trucks (27 tons/truck).

^d Transport distances (one way) for the rail routes were taken from the Supplemental EIS Section 5.1.2, Rail/Pipeline Scenario, with the exception of the connection from Lloydminster to Prince Rupert, which is from ICF 2012, Exhibit 9, pg. 16. Transport distance (one way) for the trucks was assumed to be 50 miles.

^e Daily miles traveled estimated based on one way transport distance and number of trips per day.

^f Fuel efficiency for loaded long-haul locomotives (480 ton-miles/gal) were taken from Bureau of Transportation Statistics (BTS 2011), Table 4-17: Class I Rail Freight Fuel Consumption and Travel, Year 2009. Fuel efficiency for loaded bulk tanker trucks (154 ton-miles/gal or 6.5 gal/1,000 ton-miles) were taken from the National Research Council (NRC 2010). Daily fuel used estimated based on transport distance (one way), fuel efficiency, and mass of crude transported per day.

^g Fuel economy for empty long-haul locomotives (0.14 miles/gal) were taken from BTS 2011, Table 4-17: Class I Rail Freight Fuel Consumption and Travel, Year 2009. Fuel economy for empty bulk tanker trucks (7.5 miles/gal) were taken from NRC 2010. Daily fuel used estimated based on transport distance (one way), fuel economy, and mass of crude transported per day.

^h Greenhouse gas emissions in tons per year was estimated based on emission factors, daily diesel consumed, and high heating value of diesel (0.138 MMBtu/gal). Greenhouse gas emission factors were taken from 40 CFR 98 Subpart C, Table C-1 and C-2. Total greenhouse gases were estimated as CO₂ equivalents (CO₂e), accounting for global warming potentials of CO₂ (1), CH₄ (21) and N₂O (310). MT indicates metric tons.

bbl = barrel, CFR = Code of Federal Regulations, CH₄ = methane, CO₂ = carbon dioxide, CO₂e = CO₂ equivalents, dilbit = diluted bitumen, gal = gallon, lb = pound, MMBtu = million British thermal units, MT = metric tons, N₂O = nitrous oxide, NA = not applicable, WCS = Western Canadian Select

Table 8 Estimated Direct Greenhouse Gas Emissions from the Rail/Tanker Scenario - Tanker Portion

Transport and Storage Facilities	Maximum Volume of Crude Transported Per Day, Throughput (bbl/day)	Number of Trips Per Day ^a	Transport Distance, One Way (miles) ^b	Fuel Type ^c	Propulsion Engine ^{d,e}		Auxiliary Engines ^d		Speed (miles/ hr) ^f	Activity (hours/ trip) ^g	Greenhouse Gas Emissions ^h					
					Total Max. Power Rating (kW)	Engine Load Factor	Total Max. Power Rating (kW)	Engine Load Factor			(ton/year)		(metric tons/ year)			
											CO ₂	CH ₄	N ₂ O	CO ₂ e	CO ₂ e	
New Marine Terminal at Prince Rupert, British Columbia to Texas Gulf Coast (Houston/Port Arthur) (WCS)																
Tankers ⁱ (loaded) – RSZ leaving Prince Rupert	730,000	0.83	110	MDO	9,400	0.23	1,985	0.28	10.4	10.7	6.37e3	0.039	0.30	6.46e3	5.862e3	
Tankers (loaded) – ECA cruise zone connecting Prince Rupert to Houston/Port Arthur	730,000	0.83	309	MDO	9,400	0.83	1,985	0.24	15.5	19.9	3.55e4	0.22	1.70	3.61e4	3.27e4	
Tankers (loaded) - non-ECA cruise zone connecting Prince Rupert to Houston/Port Arthur	730,000	0.83	6,354	IFO 380	9,400	0.83	1,985	0.24	15.5	409	7.66e5	4.50	34.9	7.77e5	7.05e5	
Tankers (loaded) - RSZ entering Houston/Port Arthur	730,000	0.83	40.6	MDO	9,400	0.23	1,985	0.28	10.4	3.92	2.34e3	0.014	0.11	2.38e3	2.16e3	
Tankers - hoteling at Houston/Port Arthur	730,000	0.83	0	MDO	9,400	0	1,985	0.26	0	48.0	5.69e3	0.033	0.26	5.76e3	5.23e3	
Tankers (ballast) - RSZ leaving Houston/Port Arthur	730,000	0.83	40.6	MDO	9,400	0.23	1,985	0.28	10.4	3.92	2.34e3	0.014	0.11	2.38e3	2.16e3	
Tankers (ballast) - ECA cruise zone connecting Houston/Port Arthur to Prince Rupert	730,000	0.83	309	MDO	9,400	0.83	1,985	0.24	16.1	19.2	3.43e4	0.21	1.64	3.48e4	3.15e4	
Tankers (ballast) - non-ECA cruise zone connecting Houston/Port Arthur to Prince Rupert	730,000	0.83	6,354	IFO 380	9,400	0.83	1,985	0.24	16.1	394.6	7.39e5	4.34	33.6	7.49e5	6.80e5	
Tankers (ballast) - RSZ entering Prince Rupert	730,000	0.83	110	MDO	9,400	0.23	1,985	0.28	10.4	10.7	6.37e3	0.039	0.30	6.46e3	5.86e3	
Tankers - hoteling at Prince Rupert	730,000	0.83	0	MDO	9,400	0	1,985	0.26	0	48.0	5.69e3	0.033	0.26	5.76e3	5.23e3	
										Total	1.60e6	9.45	73.2	1.63e6	1.48e6	

^a Number of tanker trips per day based on volume of crude transported per day (bbl/day) and maximum volume per Suezmax vessel light-loaded to traverse Panama Canal (884,000 bbl/tanker for crude oil) from the Supplemental EIS Section 5.1.2, Rail/Pipeline Scenario.

^b Transport distances (one way) for the tankers were derived from Poten & Partners 2012, Appendix A, using 1/2 the average round-trip distance from Prince Rupert to the Houston and Port Arthur marine terminals via the Panama Canal. North American Emission Control Areas (ECAs) are assumed to include reduced speed zones (RSZs) surrounding each port. RSZ information for Houston/Port Arthur from ICF 2009, Table 2-18: Matched Ports and Regions; Prince Rupert Harbor RSZ estimated using average of all North Pacific port RSZs.

^c Fuel types from Poten & Partners 2012, pg. 6. ECA areas mandate the use of low-sulfur marine fuel (marine diesel oil, MDO) using auxiliary engines. During cruising in non-ECA areas, tankers use main propulsion engines and intermediate fuel oil (IFO 380).

^d Engine power ratings and load factors from ICF 2009, Table 2-4 and Table 2-7.

^e Propulsion engine RSZ load factors calculated using the following equation from ICF 2009, pg. 2-11: Load Factor = (actual speed/maximum speed)^3. Maximum speed calculated using the assumption from ICF 2009 that cruise speed is an average of 94% maximum speed.

^f Tanker speeds from Poten & Partners 2012, Appendix A. Knots (nautical miles per hour) converted to miles/hour by multiplying by a factor of 1.15 miles/nautical mile.

^g Activity (duration) calculated using tanker speed and distance traveled per trip. Hoteling data from Poten & Partners 2012, Appendix A.

^h Greenhouse gas emissions in tons per year were calculated using the following equation from ICF 2009, pg. 2-1: Emissions = Power Rating x Load Factor x Activity Hours x Emission Factor. Emission factors were taken from ICF 2009, Table 2-9 for CO₂ (propulsion engine), Table 2-16 for CO₂ (auxiliary engine), and Table 2-13 for CH₄ and N₂O (medium speed diesel, or MSD, engine type). Residual oil (RO) emission factors were used for IFO. Total greenhouse gases were estimated as CO₂ equivalents (CO₂e), accounting for global warming potentials of CO₂ (1), CH₄ (21) and N₂O (310).

ⁱ Tankers are Suezmax vessels with a carrying capacity of 884,000 bbl for travel through the Panama Canal. Excluded potential lightering that would use smaller vessels (Afromax) at Houston/Port Arthur.

bbl = barrel, CH₄ = methane, CO₂ = carbon dioxide, CO₂e = CO₂ equivalents, ECAs = North American emission control areas, hr = hour, kW = kilowatt, MDO = marine diesel oil, MSD = medium speed diesel, N₂O = nitrous oxide, RO = residual oil, RSZs = reduced speed zones, WCS = Western Canadian Select crude

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